MONTGOMERY
& ASSOCIATES
Water Resource Consultants

December 2020

Groundwater Benefit Zone Study
Santa Clara County, California

Prepared for:

Santa Clara Valley Water District

Prepared by:

Montgomery & Associates

1970 Broadway, Suite 225, Oakland, California

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY 1
2 BACKGROUND AND SCOPE 1
  2.1 Groundwater Benefit Zones 1
  2.2 History of District and Groundwater Benefits 2
  2.3 Summary of Methodology 4
3 OVERVIEW OF DISTRICT ACTIVITIES 7
  3.1 District Act 7
  3.2 Managed Aquifer Recharge Activities 7
  3.3 In-Lieu Recharge Activities 8
  3.4 Groundwater Protection Activities 9
4 OVERVIEW OF BENEFITS FROM DISTRICT ACTIVITIES 11
  4.1 Improved Groundwater Supply Reliability 11
  4.2 Reduced Risk of Land Subsidence 12
  4.3 Salt Water Intrusion Prevention 15
  4.4 Improved Groundwater Quality 16
  4.5 Water Reuse Benefits 17
5 HYDROGEOLOGICALLY CONNECTED AREAS 18
  5.1 Alluvium Contact with Bedrock 18
    5.1.1 Geologic Maps 19
    5.1.2 Alluvium Formations 20
  5.2 Groundwater Divide 20
  5.3 Faults 24
  5.4 Stratigraphic Thickness 25
  5.5 Constrictions of Unconsolidated Alluvium 27
    5.5.1 Coyote Narrows 27
    5.5.2 Bedrock Outcrops in Llagas Subbasin 27
    5.5.3 Narrow Alluvial Channels 27
  5.6 Santa Clara Formation 29
6 BENEFITS TO WATER BUDGET IN HYDROGEOLOGICALLY CONNECTED AREAS FROM DISTRICT ACTIVITIES 31
  6.1 Need for District Groundwater Replenishment Activities 31
  6.2 Benefits to Water Budget from Managed Aquifer Recharge Activities 31
  6.3 Benefits to Water Budget from In-Lieu Recharge Activities 37

TABLE OF CONTENTS – continued

6.4 Application of Water Budget Evaluation to Analyses Supporting Groundwater Benefit Zones 41
7 MAPPING AND QUANTIFYING DISTRICT ACTIVITIES 42
7.1 Managed Aquifer Recharge 42
7.2 Treated Water Deliveries 44
7.3 Recycled Water 47
7.4 Surface Water Deliveries 49
7.5 Conservation Activities 49
8 GROUNDWATER LEVEL DATA EVALUATION 51
8.1 Identify Periods for Evaluation 51
8.1.1 Rainfall 52
8.1.2 Area Pumping 52
8.1.3 District Activity 59
8.2 Area Groundwater Level Trends During Evaluation Periods 60
8.2.1 Monitoring Well Groundwater Level Trends by Area 60
8.2.2 Pumping Well Groundwater Level Trends for Selected Areas 68
8.2.3 Areas Where Benefits are Not Demonstrated by Groundwater Level Trends 68
8.2.4 Areas Where Benefits are only Demonstrated by Groundwater Level Trends during Overlapping Periods 73
8.3 Areas without Groundwater Level Data 83
8.3.1 Areas Where Groundwater Level Data Unavailable during Evaluation Periods for Activities 83
8.3.2 Areas without Available Groundwater Level Data 83
8.4 Statistical Analysis 84
9 GROUNDWATER MODEL SIMULATIONS 86
9.1 Groundwater Modeling Approach 86
9.2 Santa Clara Plain Model Simulations 87
9.2.1 Baseline 87
9.2.2 Reduced Treated Water Deliveries 88
9.2.3 Reduced Managed Aquifer Recharge 88
9.2.4 Reduced Recycled Water 91
9.3 Santa Clara Plain Model Results Compared to the Groundwater Level Evaluation 93
9.3.1 Santa Clara Plain Model Results where Groundwater Level Trends Do Not Fully Demonstrate Benefits 93
9.3.2 Santa Clara Plain Model Results in Treated Water Delivery Areas 94

TABLE OF CONTENTS – continued

9.3.3 Areas not Covered by Santa Clara Plain Model 94

9.4 Llagas Model Simulations 95

9.4.1 Baseline 95

9.4.2 Reduced Managed Aquifer Recharge of Local Runoff 96

9.4.3 Reduced Managed Aquifer Recharge of Imported Water Runoff 96

9.4.4 Reduced Recycled Water 96

9.5 Llagas Model Results Compared to Groundwater Level Evaluation 100

9.5.1 Area not Covered by Llagas Model 100

10 GROUNDWATER BENEFIT ZONES 101

10.1 Zone A Benefits from Managed Aquifer Recharge, Treated Water Deliveries, and Recycled Water in the Santa Clara Plain 104

10.2 Zone B1 Benefits from Treated Water Deliveries in the Santa Clara Formation 104

10.3 Zone B2 Benefits from Treated Water Deliveries in Bedrock 104

10.4 Zone C Benefits from Managed Aquifer Recharge in Coyote Valley 106

10.5 Zone D Benefits from Managed Aquifer Recharge (Local Runoff and Imported Water) and Recycled Water in the Llagas Subbasin 106

10.6 Zone E Llagas Benefits from Managed Aquifer Recharge of Local Runoff in Uvas/Llagas Creek 106

10.7 Assignment of District Activities to Zones 106

10.8 SUMMARY OF SUPPORTING ANALYSES FOR GROUNDWATER BENEFIT ZONES 110

10.9 Economic Analysis 112

11 FINALIZING GROUNDWATER BENEFIT ZONES 114

11.1 Administrative Issues 114

11.2 Technical Review Committee 114

11.3 Stakeholder Outreach 114

11.4 Staff Recommendation 117

11.5 Metes and Bounds 118

12 SUMMARY OF FUTURE PROCEDURES 120

12.1 Procedure for Well Exemption 120

12.2 Procedure for Future Review 120

13 REFERENCES 123

14 ABBREVIATIONS 126

TABLES

Table 1. Summary of Stakeholder Outreach Communication and Meetings on Study Methodology 4
Table 2. Managed Recharge Start Dates 44
Table 3. Areas Receiving District Treated Water 44
Table 4. Summary of Pumping Areas and Non-District Treated Water Supplies 54
Table 5. Summary of Monitoring Well Groundwater Level Trends during Evaluation Periods for Managed Recharge by Pumping Area in Santa Clara Subbasin 65
Table 6. Summary of Monitoring Well Groundwater Level Trends during Evaluation Periods for Treated Water by Pumping Area in Santa Clara Subbasin 66
Table 7. Summary of Monitoring Well Groundwater Level Trends during Evaluation Periods for Managed Recharge by Pumping Area in Llagas Subbasin 67
Table 8. Summary of Pumping Well Groundwater Level Trends for Selected Pumping Areas 72
Table 9. Pumping Areas and District Activities where Groundwater Level Trends are Stable or Increasing Only During Evaluation Periods Overlapping with Different District Activity 78
Table 10. Summary of Groundwater Model Simulations Evaluated for Study 87
Table 11. District Activity Assignment to Zones 107
Table 12. Supporting Analyses by Zone and District Activity 111
Table 13. Supporting Analyses by Pumping Area and District Activity 112
Table 14. Number of Water Supply Wells in Proposed Zones Versus Existing Zones 113
Table 15. Number of Water Supply Wells Associated with District Activities under Proposed Zones Versus Existing Zones 113
Table 16. Summary of Stakeholder Outreach Meetings on Study Results 114
Table 17. Summary of Stakeholder Outreach, Comment, and Response Letters on Study 116

FIGURES

Figure ES-1. Existing Benefit Zones ES-2
Figure ES-2. DWR Bulletin 118 Subbasins and District Groundwater Management Areas ES-2
Figure ES-3. Schematic Cross-Section of Alluvium and Bedrock ES-3
Figure ES-4. Geology of Santa Clara County ES-4
Figure ES-5. Maps of District Activities ES-7
Figure ES-6. Proposed Groundwater Benefit Zones...ES-10
Figure 1. Existing Groundwater Benefit Zones 1
Figure 2. DWR Bulletin 118 Subbasins and District Groundwater Management Areas 2
Figure 3. District Activities Supporting Managed Aquifer Recharge For Benefit of Groundwater Users 8
Figure 4. District Activities Supporting In-Lieu Recharge for Benefit of Groundwater Users 9
Figure 5. Graphic Representation of Groundwater Levels, Population and Land Subsidence (Courtesy SCVWD) 12
Figure 6. Subsidence Contours with Geology 14

FIGURES – continued

Figure 7. Extent of Shallow Zone Salt Water Intrusion ... 16
Figure 8. Schematic Cross-Section of Alluvium and Bedrock ... 19
Figure 9. Geology of Santa Clara County ... 21
Figure 10. Spring and Fall Groundwater Elevation Contours for Coyote Valley and Llagas Subbasin 2000-2002 ... 22
Figure 11. Spring and Fall Groundwater Elevation Contours for Santa Clara Subbasin 2013-2015 ... 23
Figure 12. Depth to Bedrock Based on USGS Stratigraphy (Wentworth et al., 2015) ... 26
Figure 13. Locations of Bedrock Outcrop Constrictions in Llagas Subbasin ... 28
Figure 14. Santa Clara Formation Outcrop along Westside of Santa Clara Subbasin ... 30
Figure 15. Santa Clara Subbasin Natural Recharge vs. Groundwater Pumping ... 33
Figure 16. Llagas Subbasin Natural Recharge vs. Groundwater Pumping ... 34
Figure 17. Santa Clara Subbasin Total Recharge vs. Groundwater Pumping ... 35
Figure 18. Llagas Subbasin Total Recharge vs. Groundwater Pumping ... 36
Figure 19. Santa Clara Subbasin Water Budget with District In-Lieu Recharge Activities ... 39
Figure 20. Llagas Subbasin Water Budget with District In-Lieu Recharge Activities ... 40
Figure 21. District Managed Aquifer Recharge Systems ... 43
Figure 22. Retailer Areas Receiving District Treated Water Deliveries ... 46
Figure 23. Recycled Water Systems and Parcels Receiving District Untreated Surface Water ... 48
Figure 24. Parcels Receiving Conservation Rebates ... 50
Figure 25. Cumulative Departure of Mean Annual Rainfall ... 52
Figure 26. Pumping Areas in Santa Clara Plain ... 55
Figure 27. Pumping Areas in Coyote Valley ... 56
Figure 28. Pumping Areas in Llagas Subbasin ... 57
Figure 29. Example of Monitoring Well Groundwater Level Trend Evaluation of Managed Recharge in the Santa Clara Subbasin ... 62
Figure 30.Example of Monitoring Well Groundwater Level Trend Evaluation of Treated Water in the Santa Clara Subbasin ... 63
Figure 31. Example of Monitoring Well Groundwater Level Trend Evaluation for Managed Recharge in the Llagas Subbasin ... 64
Figure 32. Example of Pumping Well Groundwater Level Trend Evaluation of Managed Recharge in the Santa Clara Subbasin ... 69
Figure 33. Example of Pumping Well Groundwater Level Trend Evaluation of Treated Water in the Santa Clara Subbasin ... 70
Figure 34. Example of Pumping Well Groundwater Level Trend Evaluation of Managed Recharge in the Llagas Subbasin ... 71
Figure 35. Example of Monitoring Well Groundwater Level Trends Demonstrating Benefits from Managed Recharge Overlapping with a Period Demonstrating Benefits from Treated Water ... 74

FIGURES – continued

Figure 36. Example of Monitoring Well Groundwater Level Trends Demonstrating Benefits from Treated Water Only in an Overlapping Period........ 75
Figure 37. Example of Monitoring Well Groundwater Level Trends Demonstrating Benefits from Treated Water with Increasing Treated Water Deliveries during Overlapping Periods........ 76
Figure 38. Example of Monitoring Well Groundwater Level Trends Demonstrating Benefits from Managed Recharge with Overlapping Periods of Stable Manged Recharge 77
Figure 39. Results of Groundwater Level Trend Evaluation of Benefits from Managed Aquifer Recharge in Santa Clara Subbasin 81
Figure 40. Results of Groundwater Level Trend Evaluation of Benefits from Treated Water Deliveries in Santa Clara Subbasin 82
Figure 41. Results of Groundwater Level Trend Evaluation of Benefits from Managed Aquifer Recharge in Llagas Subbasin........ 85
Figure 42. Simulated Groundwater Difference due to Reduced Treated Water Deliveries in Santa Clara Plain 89
Figure 43. Simulated Groundwater Difference due to Reduced Managed Recharge in Santa Clara Plain 90
Figure 44. Simulated Groundwater Level Difference due to Reduced Recycled Water in Santa Clara Plain 92
Figure 45. Simulated Groundwater Level Difference due to Reduced Managed Recharge of Local Runoff in Llagas Subbasin........ 97
Figure 46. Simulated Groundwater Level Difference due to Reduced Managed Recharge of Imported Water in Llagas Subbasin 98
Figure 47. Simulated Groundwater Level Difference due to Reduced Recycled Water in Llagas Subbasin........ 99
Figure 48. Proposed Groundwater Benefit Zones........ 103
Figure 49. Zones A and B in Santa Clara Formation on Westside of Santa Clara Subbasin........ 105
Figure 50: Managed Recharge Facilities and Treated Water Deliveries with Groundwater Benefit Zones........ 108
Figure 51:Recycled Water Systems and Parcels Receiving Untreated Surface Water with Groundwater Benefit Zones........ 109

Appendices

Appendix A. Methodology Memorandum

Appendix B. Comments and Responses to Comments on Methodology

Appendix C. Groundwater Level Trends in Monitoring Wells to Evaluate Benefits from Managed Aquifer Recharge in Santa Clara Subbasin

Appendices – continued

Appendix D. Groundwater Level Trends in Monitoring Wells to Evaluate Benefits from Treated Water Deliveries

Appendix E. Groundwater Level Trends in Monitoring Wells to Evaluate Benefits from Managed Aquifer Recharge in Llagas Subbasin

Appendix F. Groundwater Level Trends in Production Wells to Evaluate Benefits from District Activities in Select Pumping Areas

Appendix G. Mann-Kendall Statistics for Groundwater Level Data

Appendix H. Santa Clara Plain Groundwater Model Simulations Memo

Appendix I. Llagas Groundwater Model Simulations Memo

Appendix J. Technical Review Committee Comments on Study

Appendix K. Stakeholder Comments and Responses to Comments on Study

Appendix L. Adopted Metes and Bounds and Supplemental Information

- Appendix L-1. Simplification of Boundary and Boundary Uncertainty
- Appendix L-2. Description of Approach to Metes and Bounds
- Appendix L-3. Record of Survey for Metes and Bounds
- Appendix L-4. Adopted Metes and Bounds for Amended Zone W-2
- Appendix L-5. Adopted Metes and Bounds for Amended Zone W-5
- Appendix L-6. Adopted Metes and Bounds for Zone W-7
- Appendix L-7. Adopted Metes and Bounds for Zone W-8

Appendix M. Groundwater Benefit Zone Exemption Process

Appendix N. Process to Conduct Future Reviews of Groundwater Benefit Zones

1 EXECUTIVE SUMMARY

The Santa Clara Valley Water District (District) Act gives the District Board of Directors the authority to establish, amend, and revise groundwater charge zones (also called groundwater benefit zones or Zones, District Act Section 3) and to levy and collect groundwater charges within a zone or zones that benefit from the recharge of underground water supplies or the distribution of imported water (District Act Section 26). The two existing Zones, W-2 and W-5, were established in 1963 and 1977, respectively. Zone W-2 generally covers the Santa Clara Plain in North County while Zone W-5 generally covers the Coyote Valley and Llagas Subbasin in South County (Figure ES-1) where Santa Clara Plain, Coyote Valley and Llagas Subbasin are groundwater management areas delineated by the District (Figure ES-2). California Department of Water Resources (DWR) defines the Santa Clara Plain and Coyote Valley areas as the Santa Clara Subbasin.

The purpose of the Groundwater Benefit Zone Study (Study) is to provide a comprehensive review of the Zones to ensure they reflect areas where groundwater users receive similar benefits from current and planned District groundwater management activities. Although the District is not aware of any specific problems with the existing Zone designations, the District has received requests for exemptions and recognizes that it is important for the District to periodically undertake an updated analysis of the Zones, and revise the boundaries if appropriate. The Study is based on evaluation of the subsurface characteristics that govern the movement of groundwater (called hydrogeologic characteristics) and the ways that District activities benefit groundwater users. These benefits are derived not only from direct groundwater recharge with surface water supplies (called managed aquifer recharge), but also from delivery of treated water, untreated surface water, and recycled water directly to users, which reduces groundwater extraction (called in-lieu recharge). Other direct and indirect benefits of the District's comprehensive groundwater management program include demand management, development of alternative water supplies, long-term water conservation, and protection of water quality.

A groundwater benefit zone includes any area within the District’s legal jurisdiction where any of the following criteria are met:

- A District activity provides water supply
- District activities improve groundwater supply reliability
- District activities prevent or limit land subsidence
- District activities reverse or control salt water intrusion
- District activities improve or maintain groundwater quality
- District activities improve groundwater levels

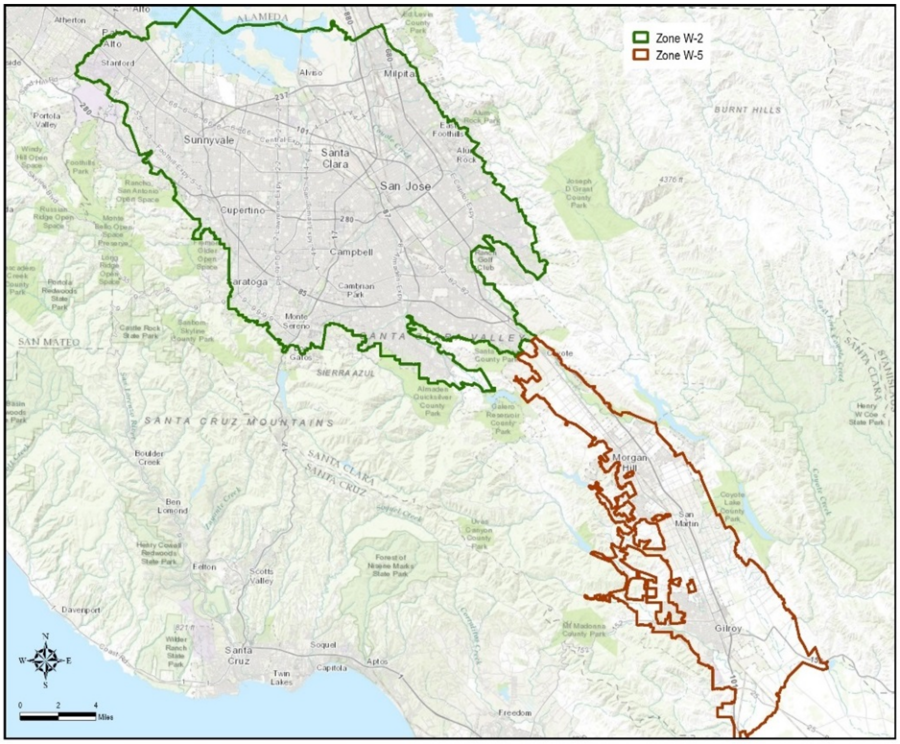


Figure ES-1. Existing Groundwater Benefit Zones

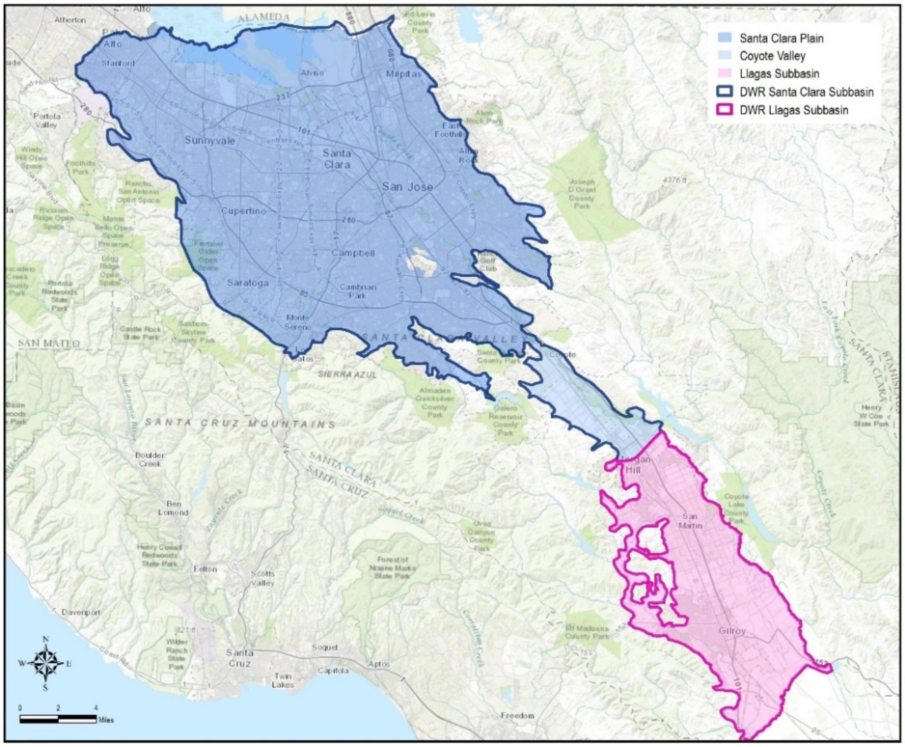


Figure ES-2. DWR Bulletin 118 Subbasins and District Groundwater Management Areas

The Study is based on the premise that benefits from District activities extend throughout areas connected by groundwater flow (called hydrogeologically connected areas) that occurs in similar geologic deposits. The hydrogeologically connected areas are primarily defined by the geologic contact between alluvium (gravel, sand, silt, and clay sediments deposited by streams) in the valley floors and bedrock of the adjacent mountain ranges (Figure ES-3 and Figure ES-4). Groundwater generally flows through the alluvium until encountering bedrock or other hydrogeologic boundaries so continuous areas of alluvium are generally hydrogeologically connected. The hydrogeologic connection in bedrock is likely limited in spatial extent. Other hydrogeologic boundaries include groundwater divides between areas where groundwater flows in opposite directions, faults, areas where alluvium narrows and/or steepens, and contacts between alluvium formations with different levels of consolidation as narrower spaces between the alluvial sediments restrict groundwater flow. Geologic formations of alluvium that are candidates for hydrogeologically connected areas in the Study area include Unconsolidated Alluvium (alluvium) and the Santa Clara Formation (Figure ES-4).

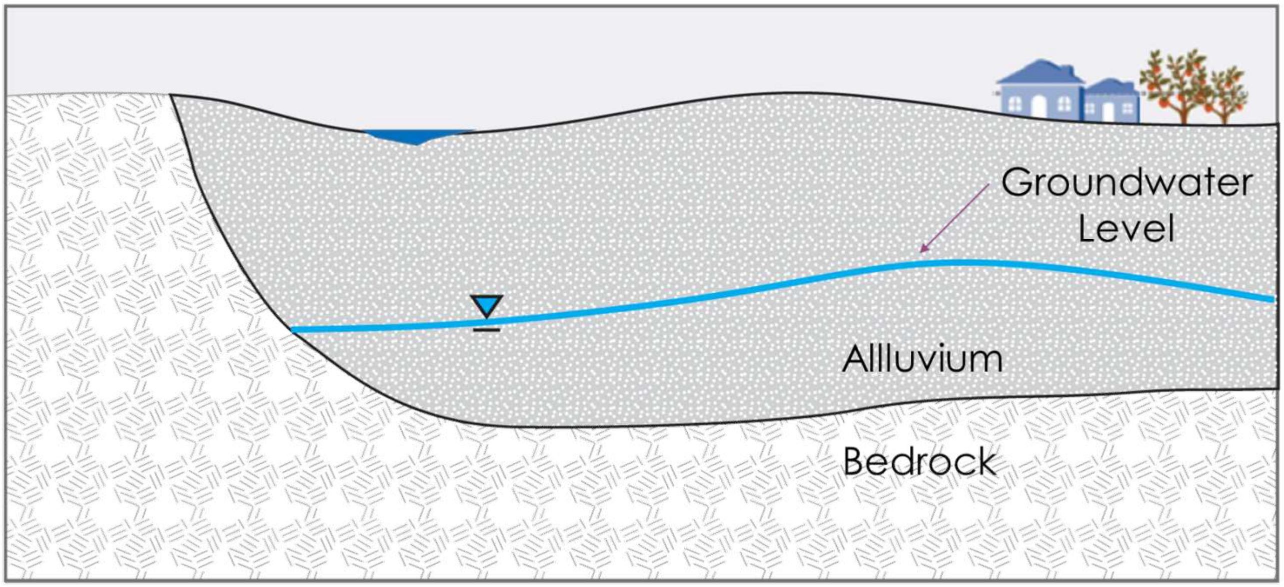
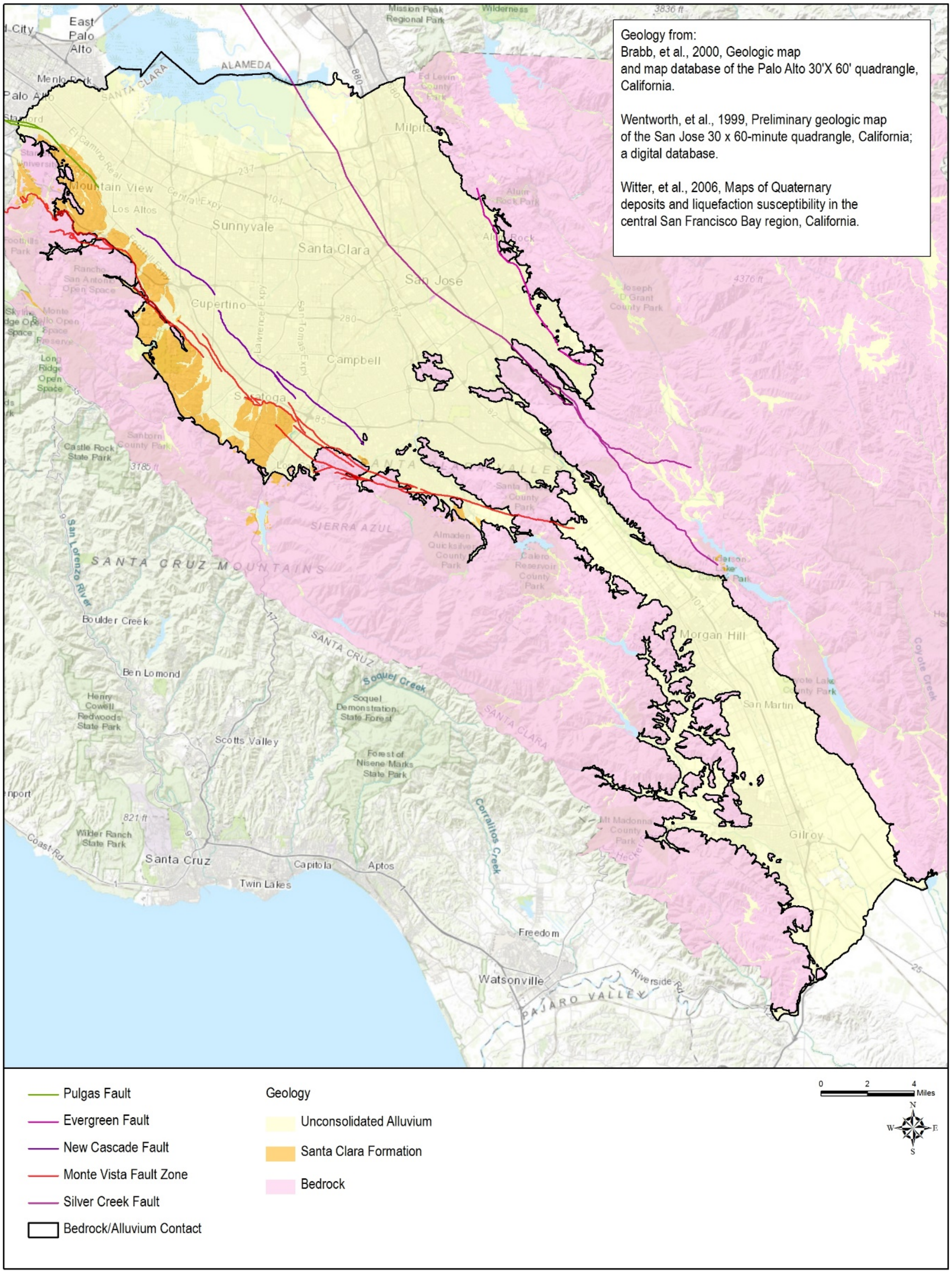


Figure ES-3. Schematic Cross-Section of Alluvium and Bedrock



Geology from:
Brabb, et al., 2000, Geologic map and map database of the Palo Alto 30'X 60' quadrangle, California.

Wentworth, et al., 1999, Preliminary geologic map of the San Jose 30 x 60-minute quadrangle, California; a digital database.

Witter, et al., 2006, Maps of Quaternary deposits and liquefaction susceptibility in the central San Francisco Bay region, California.

Figure ES-4. Geology of Santa Clara County

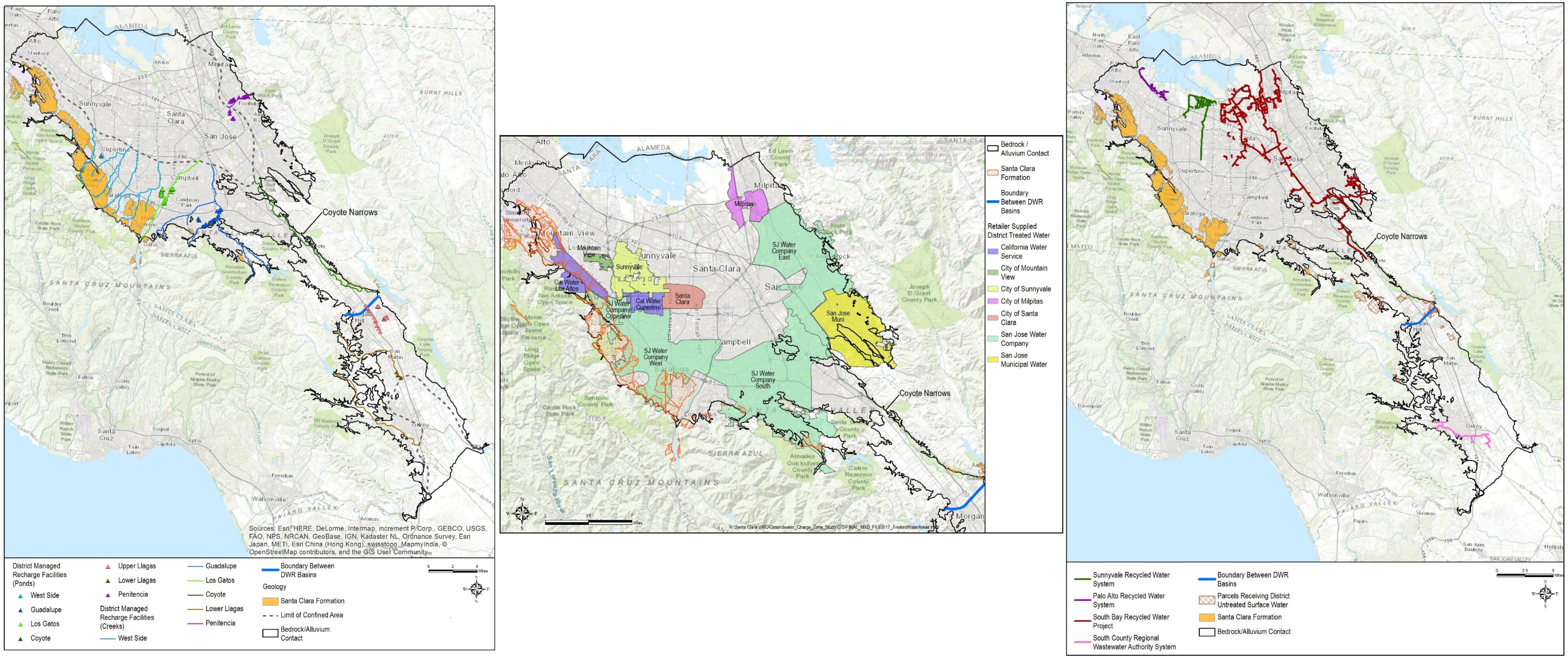
An evaluation of water budgets of the subbasins shows the benefits of District groundwater replenishment activities of managed recharge and in-lieu recharge. Without these groundwater replenishment activities, groundwater pumping would exceed recharge. By better balancing recharge and groundwater pumping, District activities improve groundwater levels, which provides benefits of improving groundwater supply reliability, limiting land subsidence, and controlling saltwater intrusion.

The Study uses historical data and numerical groundwater modeling to evaluate the extent of hydrogeologically connected areas benefiting from District activities (Figure ES-5). If data and modeling are insufficient to assess whether an area benefits from one or more District activities, the Study uses assumptions about hydrogeologic connection within and between different alluvium and bedrock formations to evaluate where benefits extend from District activities.

The Study reaches the following conclusions that lead to the development of proposed groundwater benefit zones:

1. District recharge activities are located in alluvium that provides hydrogeologic connection throughout the Santa Clara and Llagas Subbasins.
2. District recharge activities have improved the water balance in hydrogeologically connected areas over time.
3. Groundwater level data and numerical groundwater modeling results demonstrate that benefits from District activities extend throughout hydrogeologically connected areas of Unconsolidated Alluvium where the District activities are located.
4. The groundwater level data do not conclusively demonstrate that benefits of District treated water deliveries in the Santa Clara Plain extend south into Coyote Valley as the Coyote Narrows may restrict groundwater flow between the two management areas.
5. Groundwater level data and modeling results are not available to evaluate whether benefits from District activities in the Unconsolidated Alluvium of the Santa Clara Plain extend into the Santa Clara Formation located on the west side of the Santa Clara Plain and there lacks information documenting a hydrogeological connection between the Santa Clara Formation and the Unconsolidated Alluvium.
6. District treated water delivery reduces groundwater demand in the Santa Clara Formation thereby improving the groundwater supply. The Santa Clara Formation consists of hydrogeologically connected alluvium. Therefore, District in-lieu recharge activities in the Santa Clara Formation benefit connected areas of the Santa Clara Formation. However, the uncertainty of this conclusion is higher than a similar conclusion for the Unconsolidated Alluvium due to lack of groundwater level data and numerical groundwater modeling.

7. Groundwater level data and modeling results are not available to evaluate whether benefits from District activities in alluvium (Unconsolidated Alluvium or Santa Clara Formation) extend into bedrock. However, bedrock areas receiving District treated water supplies benefit from in-lieu recharge to those areas that reduce groundwater pumping from bedrock fractures. However, bedrock fractures may be limited in areal extent, so the benefit is not considered to extend beyond the bedrock areas receiving District treated water.
8. Groundwater level data and modeling results are not available to demonstrate that managed recharge of imported water in the Llagas Subbasin valley floor benefits the narrow alluvium along Llagas and Uvas Creeks downstream of District reservoirs and upstream of the valley floor. However, the alluvium along these creeks does benefit from District releases of local runoff for managed recharge.



Managed Aquifer Recharge Facilities

Treated Water Delivery Areas (In-lieu Recharge)

Recycled Water Systems and Surface Water Delivery Parcels (In-lieu Recharge)

Coyote Narrows
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
District Managed Recharge Facilities (Ponds)
West Side
Guadalupe
Los Gatos
Coyote
Upper Llagas
Lower Llagas
Penitencia
District Managed Recharge Facilities (Creeks)
West Side
Guadalupe
Los Gatos
Coyote
Lower Llagas
Penitencia
Boundary Between DWR Basins
Geology
Santa Clara Formation
Limit of Confined Area
Bedrock/Alluvium Contact
Miles
Bedrock / Alluvium Contact
Santa Clara Formation
Boundary Between DWR Basins
Retailer Supplied District Treated Water
California Water Service
City of Mountain View
City of Sunnyvale
City of Milpitas
City of Santa Clara
San Jose Water Company
San Jose Municipal Water
Milpitas
SJ Water Company East
Sunnyvale
Santa Clara
Cal Water Los Altos
Cal Water Cupertino
SJ Water Company Cupertino
SJ Water Company West
SJ Water Company South
San Jose Muni
Coyote Narrows
Sunnyvale Recycled Water System
Palo Alto Recycled Water System
South Bay Recycled Water Project
South County Regional Wastewater Authority System
Boundary Between DWR Basins
Parcels Receiving District Untreated Surface Water
Santa Clara Formation
Bedrock/Alluvium Contact
Coyote Narrows

Figure ES-5. Maps of District Activities

Based on the above conclusions, the Study proposes the following benefit zones as shown on Figure ES-6.

Zone A: Benefits from Managed Aquifer Recharge, Treated Water Deliveries, and Recycled Water Programs in the Santa Clara Plain – Zone A consists of areas overlying Unconsolidated Alluvium, and benefits from District treated water deliveries, managed aquifer recharge using local runoff and imported water, and recycled water programs. Zone A excludes areas of mapped Santa Clara Formation where benefits from managed aquifer recharge activities are not evaluated due to limited well data. The northern boundary is the San Mateo-Santa Clara County line, and the southern boundary is the boundary between existing Zones W-2 and W-5.

Zone B1: Benefits from Treated Water Deliveries in the Santa Clara Formation – Zone B1 consists of areas within the Santa Clara Formation that are hydrogeologically connected to areas where District treated water is delivered. Data are not available to demonstrate benefits from the District’s managed aquifer recharge. Foothill Expressway is used to approximate the eastern extent of the Santa Clara Formation underlying the alluvial outcrop. In addition to approximating this geological boundary, this also lines up with the District treated water delivery area for the Cal Water Los Altos service area; the treated water delivery provides in-lieu benefits for this area of the zone.

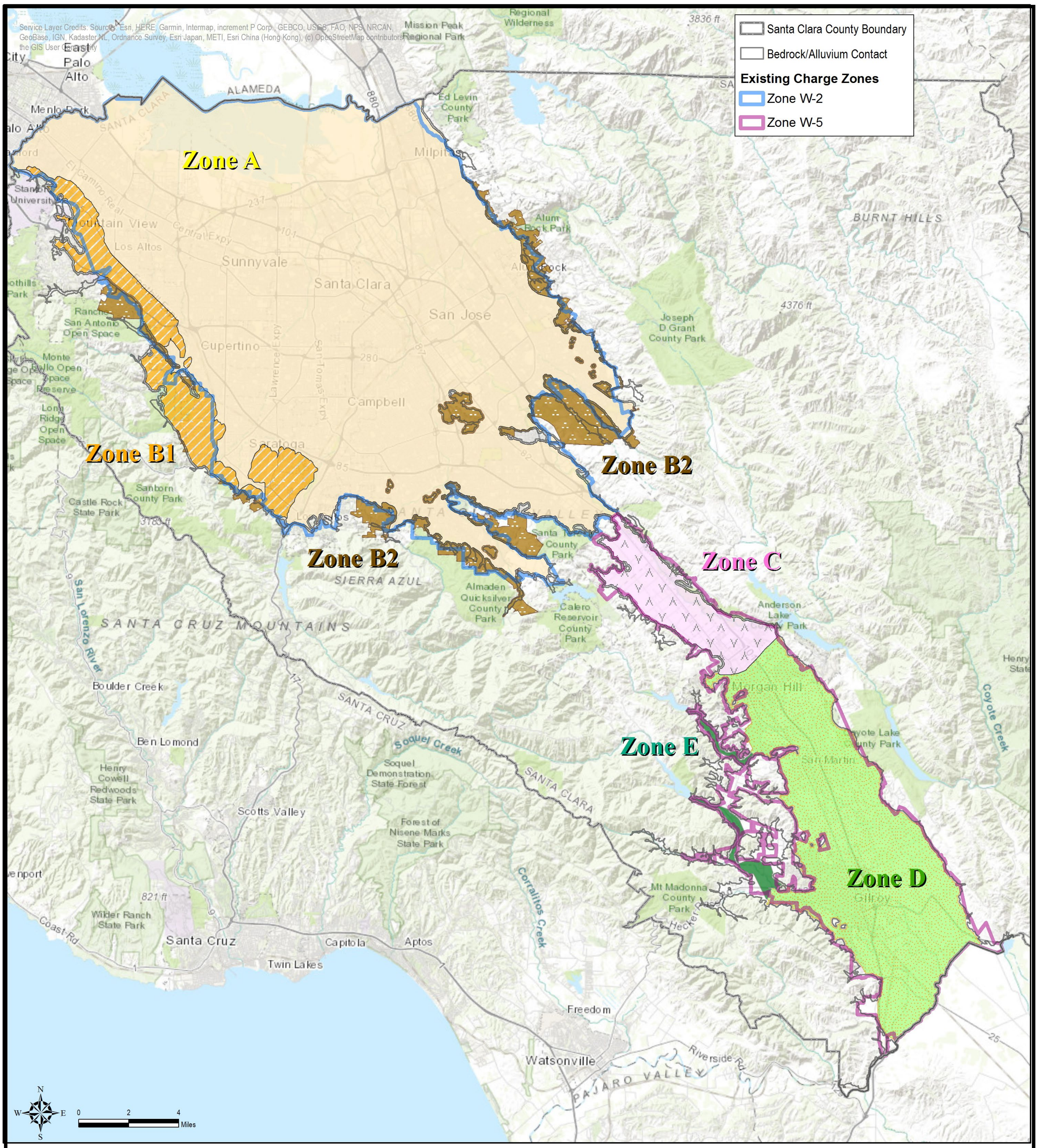
Zone B2: Benefits from Treated Water Deliveries in Bedrock – Zone B2 consists of areas with underlying bedrock where District treated water is delivered. Bedrock areas outside the treated water delivery areas are excluded from this and other zones because bedrock fractures with accessible groundwater may be limited in areal extent. Therefore, the benefit is not considered to extend beyond the treated water delivery area. Zone B2 includes many separate areas where bedrock underlies District treated water delivery areas.

Zone C: Benefits from Managed Aquifer Recharge in Coyote Valley – Zone C consists of Unconsolidated Alluvium in the Coyote Valley where benefits from managed aquifer recharge using both local runoff and imported water are demonstrated. The northern boundary is the boundary between existing Zones W-2 and W-5. The southern boundary is the boundary between the California Department of Water Resources (DWR) Santa Clara and Llagas Subbasins that approximates the groundwater divide separating the two basins.

Zone D: Benefits from Managed Aquifer Recharge (Local Runoff and Imported Water) and Recycled Water Programs in the Llagas Subbasin – Zone D consists of areas overlying Unconsolidated Alluvium in the Llagas Subbasin where benefits from managed aquifer recharge of imported and local water are demonstrated. The zone contains the entire retail service areas of the cities of Morgan Hill and Gilroy because groundwater pumped from areas where benefits are demonstrated are delivered to these hydrogeologically connected areas within Morgan Hill and Gilroy. The northern boundary is the boundary between the Santa Clara and Llagas

Subbasins as defined by DWR. The southern boundary is based on the Santa Clara-San Benito County line corresponding with the southern extent of Unconsolidated Alluvium in Santa Clara County.

Zone E: Benefits from Managed Aquifer Recharge of Local Runoff in Uvas/Llagas – Zone E consists of areas overlying Unconsolidated Alluvium along upper Uvas and Llagas Creeks where District managed aquifer recharge of local runoff occurs. This includes Unconsolidated Alluvium west of the cities of Morgan Hill and Gilroy that are deposited along Llagas Creek and Uvas Creek below the District's Chesbro and Uvas Reservoirs. These narrow alluvial channels are surrounded by bedrock outcrops and are upstream of the main valley floor. The boundary between proposed Zones D and E is based upon the location where data and groundwater model results are available to demonstrate benefit from imported water and the boundaries of retail service areas of the cities of Morgan Hill and Gilroy. Alluvial channels for tributaries that are not directly downstream of the District's reservoirs are excluded from this zone.



These mapped zones may be revised further to account for administrative requirements. These zones will also require additional revision to facilitate the development of legal descriptions for the zones. This will involve approximating the boundaries to reduce the number of line segments that require a metes and bounds description.

Zone A: Benefits from Managed Aquifer Recharge, Treated Water Deliveries, and Recycled Water Programs in the Santa Clara Plain

Zone A consists of areas overlying Unconsolidated Alluvium, and benefits from District treated water deliveries, managed aquifer recharge using local runoff and imported water, and recycled water programs. Zone A excludes areas of mapped Santa Clara Formation where benefits from managed aquifer recharge activities are not evaluated due to limited well data. The northern boundary is the San Mateo-Santa Clara County line and the southern boundary is the boundary between existing Zones W-2 and W-5.

Zone B1: Benefits from Treated Water Deliveries in the Santa Clara Formation

Zone B1 consists of areas within the Santa Clara Formation that are hydrogeologically connected to areas where District treated water is delivered. Data are not available to demonstrate benefits from the District's managed aquifer recharge. Foothill Expressway is used to approximate the eastern extent of the Santa Clara Formation underlying the alluvial outcrop. In addition to approximating this geological boundary, this also lines up with the District treated water delivery area for the Cal Water Los Altos service area; the treated water delivery provides in-lieu benefits for this area of the zone.

Zone B2: Benefits from Treated Water Deliveries in Bedrock

Zone B2 consists of areas with underlying bedrock where District treated water is delivered. Bedrock areas outside the treated water delivery areas are excluded from this and other zones because bedrock fractures with accessible groundwater may be limited in areal extent. Therefore, the benefit is not considered to extend beyond the treated water delivery area. Zone B2 includes many separate areas where bedrock underlies District treated water delivery areas.

All zones benefit from long-term water conservation and groundwater protection activities

Zone C: Benefits from Managed Aquifer Recharge in Coyote Valley

Zone C consists of Unconsolidated Alluvium in the Coyote Valley where benefits from managed aquifer recharge using both local runoff and imported water are demonstrated. The northern boundary is the boundary between existing Zones W-2 and W-5. The southern boundary is the boundary between the California Department of Water Resources (DWR) Santa Clara and Llagas subbasins that approximates the groundwater divide separating the two basins.

Zone D: Benefits from Managed Aquifer Recharge (Local Runoff and Imported Water) and Recycled Water Programs in the Llagas Subbasin

This zone consists of areas overlying Unconsolidated Alluvium in the Llagas Subbasin where benefits from managed aquifer recharge of imported and local water are demonstrated. The zone contains the entire retail service areas of the cities of Morgan Hill and Gilroy. The northern boundary is the boundary between the Santa Clara and Llagas subbasins as defined by DWR. The southern boundary is based on the Santa Clara-San Benito County line corresponding with the southern extent of Unconsolidated

Zone E: Benefits from Managed Aquifer Recharge of Local Runoff in Uvas/Llagas Creek Bottoms

This zone consists of areas overlying Unconsolidated Alluvium along upper Uvas and Llagas creeks where District managed aquifer recharge of local runoff occurs. This includes Unconsolidated Alluvium west of the cities of Morgan Hill and Gilroy that are deposited along Llagas Creek and Uvas Creek below the District's Chesbro and Uvas Reservoirs. These narrow alluvial channels are surrounded by bedrock outcrops and are upstream of the main valley floor. The boundary between proposed Zones D and E is based upon the location where data and groundwater model results are available to demonstrate benefit from imported water. Alluvial channels for tributaries that are not directly downstream of the District's reservoirs are excluded from this zone.

H:\Santa Clara VWD\Groundwater_Charge_Zone_Study\GIS\FINAL_MXD_FILES\zoneMAPS\ZOB_figures\3_Draft_Zones_of_Benefit.mxd

Figure ES-6. Proposed Groundwater Benefit Zones

The Study proposes an increase in Groundwater Benefit Zones (zones) from two zones to six zones that benefit from specific activities. This proposal is a result of a technical analysis that does not consider the related administrative issues or requirements for new or revised zones. Any changes to the zones must be approved by the Santa Clara Valley Water District's Board of Directors (Board), which considers all related issues.

The geologic coverage boundaries are based on spatial interpretation and include uncertainty. The proposed zones are based primarily on geologic coverages consisting of many connected lines, which would be unnecessarily expensive to describe without simplification. Therefore, zone boundaries were simplified for Board consideration in advance of preparing metes and bounds as required by the District Act. The simplification essentially smooths the boundary by reducing the number of individual line segments. In addition to simplifying the boundaries, zone boundaries at geologic boundaries have been adjusted to account for the uncertainty of those boundaries by making each zone smaller in accordance with geologic mapping error.

At its October 8, 2019 regular meeting, staff recommended that four of the six zones proposed by the Study be adopted. The Board approved the staff-recommended changes to the zones and directed that metes and bounds descriptions be prepared.

At its April 28, 2020 meeting, the Board adopted metes and bounds descriptions for the four new and modified zones recommended by District staff. The effective date for the adopted zones is July 1, 2020. The four zones adopted by the Board are:

- Modified Zone W-2, the Santa Clara Plain Valley Floor, which matches Zone A proposed by the Study.
- Modified Zone W-5, the Llagas Subbasin Valley Floor, which matches Zone D proposed by the Study.
- New Zone W-7, the Coyote Valley, created to match Zone C proposed by the Study.
- New Zone W-8, the Llagas Subbasin Alluvium below Uvas and Chesbro Reservoirs, created to match Zone E proposed by the Study.

The Study also includes proposed processes for well exemptions from the groundwater benefit zones and future reviews of the groundwater benefit zones. Well exemptions are recommended to be evaluated based on well owner requests and on geology documented by the well log and other sources. Future reviews are recommended if the District substantially changes the activities that provide benefits, or significant new hydrogeologic data become available.

2 BACKGROUND AND SCOPE

2.1 Groundwater Benefit Zones

The Santa Clara Valley Water District (District) Act gives the District Board of Directors the authority to establish, amend, and revise groundwater benefit zones (District Act Section 3), and to levy and collect groundwater charges within a zone or zones that benefit from the recharge of underground water supplies or the distribution of imported water (District Act Section 26). The two primary existing groundwater benefit zones, Zones W-2 and W-5, were established in 1963 and 1977, respectively. Zone W-2 generally covers the Santa Clara Plain in North County while Zone W-5 generally covers the Coyote Valley and Llagas Subbasin in South County (Figure 1).

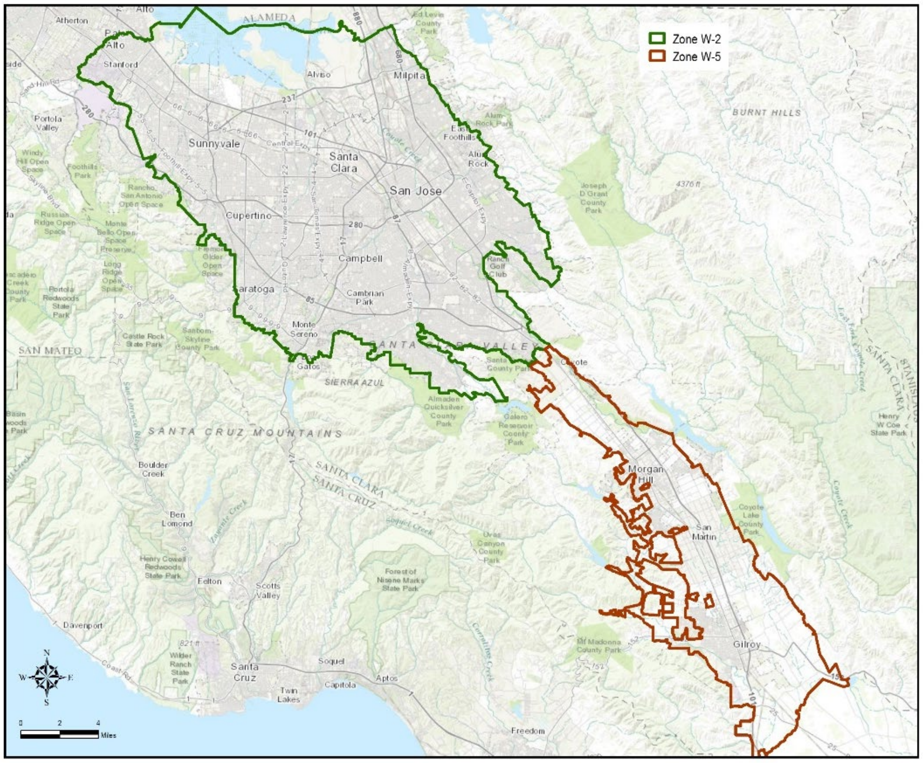


Figure 1. Existing Groundwater Benefit Zones

Figure 2 shows the three groundwater management areas of the District: the Santa Clara Plain, Coyote Valley, and Llagas Subbasin, along with the California Department of Water Resources (DWR) subbasin boundaries. Coyote Valley is part of District Zone W-5, but DWR includes Coyote Valley as part of the Santa Clara Subbasin.

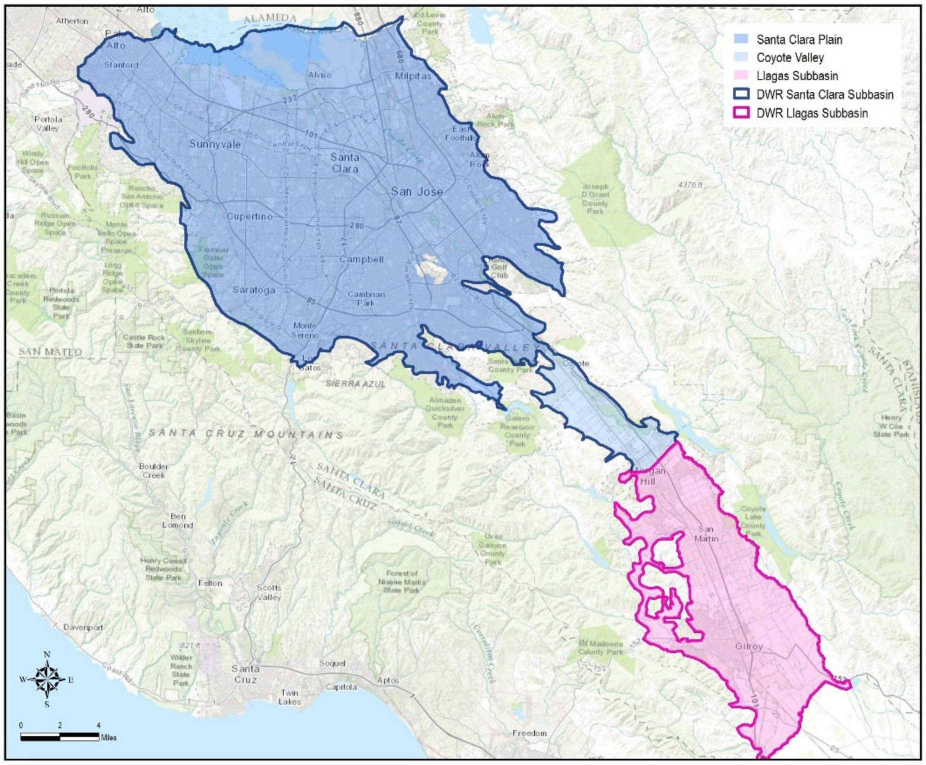


Figure 2. DWR Bulletin 118 Subbasins and District Groundwater Management Areas

The purpose of the Groundwater Benefit Zone Study (Study) is to complete a comprehensive review of the groundwater benefit zones to ensure they reflect areas where groundwater users receive similar benefits from current and planned District activities. Although the District is not aware of any specific problems with the existing groundwater benefit zone designations, the District has received requests for exemptions and recognizes that it is important for the District to periodically undertake an updated analysis of various factors upon which the zones are based and revise the boundaries if necessary. The Study evaluates the ways in which the various District activities benefit groundwater users. These benefits are derived not only from the conjunctive use of surface water supplies for direct groundwater recharge, but also include the direct and indirect benefits of the District's comprehensive groundwater management, including in-lieu recharge, demand management, development of alternative water supplies, long-term conservation, and protection of water quality, amongst others.

2.2 History of District and Groundwater Benefits

The District has provided groundwater benefits to Santa Clara County for approximately ninety years. In 1929, County voters approved the formation of the Santa Clara Valley Water Conservation District (SCVWCD), the forerunner to the District, in order to stop groundwater overdraft and subsidence. Today’s District was formed through the consolidation and annexation of multiple flood control and water districts within Santa Clara County. From 1935 to 1957, District forerunners constructed dams to capture surface water runoff for groundwater recharge. This period coincided with a period of recovery in groundwater levels that reduced the rate of land subsidence from the late 1930s to 1947 (SCVWD, 2016b).

Drought conditions beginning in 1947 resulted in rapidly declining groundwater levels and a resumption of subsidence and by 1950, groundwater met almost all of the County's water demand. Despite delivery by San Francisco Public Utilities Commission (SFPUC) of imported water to northern Santa Clara County in the 1950s, groundwater pumping increased resulting in further groundwater declines as the County's population doubled from 1950 to 1960. As the area's water demands exceeded the combination of SFPUC imported water and local water supplies, the District contracted with the State Water Project to receive imported water through the South Bay Aqueduct (SCVWD, 2016b).

Having this source of imported water allowed the District to deliver treated surface water to North County residents, which offset the need for groundwater pumping in the Santa Clara Plain and led to recovery of groundwater levels and reduced rate of subsidence. Deliveries of SFPUC imported water also increased in the 1960s contributing to these water budget improvements. By the mid-1980s, the County's population had more than doubled from 1960, but groundwater pumping was down to half of total water use and rate of inelastic land subsidence was reduced approximately 99%. The District contracted with the federal government for additional source of imported supply from the Central Valley Project in 1987 to continue providing groundwater benefits as the economy and population continued to grow (SCVWD, 2016b).

In the 1990s, the District supported expansion of recycled water use to reduce the demand on groundwater. The construction and operation of the District's Silicon Valley Advanced Water Purification Center beginning in 2014 that delivers purified water that is a result of treating tertiary-treated recycled water with microfiltration, reverse osmosis, and ultraviolet light. This additional source of water supply provides current and future benefits by reducing the demand on groundwater and may also be a source for future recharge of groundwater (SCVWD, 2016b).

The District responded to the 1976-1977 drought by implementing its first conservation programs, expanded the efforts during the 1987-1992 drought, and continues with enhancements to these programs to provide groundwater benefits by reducing groundwater demand.

The District has identified groundwater contamination as a significant issue for the resource beginning in the 1980s. The District has since developed multiple programs to protect groundwater quality in the subbasins.

2.3 Summary of Methodology

HydroMetrics WRI, now Montgomery & Associates, developed the methodology for the Study and documented it in the Methodology for Evaluating Groundwater Zones of Benefit, Santa Clara County, California (HydroMetrics WRI, 2016) as provided in Appendix A.

The District presented draft versions of the methodology to stakeholder groups including at a community open house, a small group briefing, and two meetings with District retailers as summarized in Table 1. A Technical Review Committee (TRC) also provided review of the methodology. Appendix B provides the stakeholder and TRC comments, and responses to those comments.

Table 1. Summary of Stakeholder Outreach Communication and Meetings on Study Methodology

Date	Stakeholder Group	Venue	Subject
3/2/2015	Water Supply Well Owners Near Zone Boundary	Letter	Notification of Open House on Study Methodology
3/4/2015	Retailers Groundwater Subcommittee	Meeting	Study Methodology
3/12/2015	All Interested Stakeholders	Open House	Study Methodology
7/13/2015	District Board of Directors Agricultural Water Advisory Committee	Meeting	Study Methodology
10/13/2015	District Board of Directors and Interested Stakeholders	Meeting	Study Methodology
10/22/2015	Retailers Groundwater and Water Supply Subcommittees	Joint Subcommittee Meeting	Study Methodology
10/28/2015	All Interested Stakeholders	Small Group Briefing	Study Methodology

Implementation of the Study required minor revisions to the methodology based on data availability, including:

- The Study uses pumping in a retailer area to account for in-lieu supplies other than the District activity instead of net demand;
- The Study evaluates periods when the District activity is active and constant instead of just periods when the District activity is increasing; and

- The Study evaluates groundwater levels by retailer area instead of at each well.

A groundwater benefit zone includes any area within the District's legal jurisdiction where any of the following criteria are met:

- A District activity provides water supply
- District activities improve groundwater supply reliability
- District activities improve groundwater levels
- District activities prevent or limit land subsidence
- District activities reverse or control salt water intrusion
- District activities improve or maintain groundwater quality

The Study uses historical groundwater level, subsidence, salt water intrusion, and groundwater quality data and groundwater flow modeling where available to assess the extent of areas benefitting from one or more District activities. The periods over which data and modeling can be evaluated for benefits are limited so the Study evaluates historical water budgets to assess whether benefits demonstrated in any time period can be applied to other periods.

If data and modeling are insufficient to assess whether an area benefits from District activities, the following assumptions are made:

- Benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity.
- Areas with groundwater supplies that receive in lieu supplies from the District benefit from that District activity.

Evaluating groundwater benefit zones is based on the hydrogeological characteristics that govern the movement of groundwater, District activities, and the benefits to groundwater users provided by the activities. The Study follows the steps below:

1. Map an overview of benefits from District activities such as halting subsidence and reversing salt water intrusion that may require additional evaluation to associate benefits to specific sets of District activities.
2. Map hydrogeologic features and groundwater occurrence and movement to define hydrogeologically connected areas.
3. Plot water budget of pumping, managed recharge and in-lieu recharge over time in hydrogeologically connected areas to assess where the benefit of District activities can be demonstrated.

4. Map current and planned District activities that provide or will provide benefits to groundwater users in the District.
5. Use groundwater data and groundwater flow models where available to demonstrate the extent of benefit of District activities.
6. Create recommended groundwater benefit zones by grouping areas where users benefit from a specific set of District activities.

In implementing the methodology, the Study considers the following information:

- Geologic maps
- Geologic descriptions
- Groundwater level contour maps
- Fault maps
- Estimates of stratigraphic thickness
- Surface elevation
- Groundwater pumping quantities by area
- District managed aquifer recharge quantities by subbasin
- District treated water delivery quantities by subbasin
- District surface water delivery quantities by subbasin
- District supported recycled water delivery quantities by subbasin
- Conservation rebate locations
- Area precipitation
- Population changes
- Start dates of District activities
- Locations of District managed recharge activities
- Delivery areas of District and District supported in-lieu recharge activities
- Availability of non-District water supplies
- Groundwater level data
- Groundwater quality data
- Well locations
- Groundwater model simulation results

3 OVERVIEW OF DISTRICT ACTIVITIES

3.1 District Act

Section 3 of the District Act empowers the District Board to establish groundwater benefit zones. Section 26 describes the District activities that provide benefits. These District activities include:

- Groundwater recharge
- Importing water
- Runoff capture
- Water storage
- Water treatment
- Water distribution
- Water recycling
- Groundwater protection
- Water conservation

The primary benefits to groundwater users are derived from District activities that support some form of groundwater replenishment. Groundwater replenishment can be classified as managed aquifer recharge and in-lieu recharge, each of which involves some combination of the above activities and are described further below. Groundwater replenishment provides benefits to maintain a reliable water supply, reduce risk of permanent land subsidence, and improve groundwater quality, as summarized in Section 4. By maintaining groundwater levels, groundwater replenishment also reduces pumping costs to well users.

Groundwater protection activities provide benefits to groundwater quality independently of groundwater recharge activities and maintaining groundwater quality is a key component of maintaining groundwater supply reliability. As further detailed in Section 4.4, these activities provide benefits to improve the reliability of the groundwater supply to meet drinking water standards, irrigation quality requirements, and quality needs of other uses.

3.2 Managed Aquifer Recharge Activities

Managed aquifer recharge improves groundwater conditions by supplementing natural recharge of the underlying aquifers with both local surface runoff and imported water. Natural recharge is insufficient to support groundwater pumping in the subbasins. How adding managed aquifer recharge balances groundwater pumping is further described in Section 6.2. By helping balance groundwater pumping, managed aquifer recharge provides benefits of improving groundwater levels thereby potentially improving groundwater supply reliability, preventing or limiting subsidence, and reversing or controlling salt water intrusion. Managed aquifer recharge can also improve groundwater quality. Activities that support managed aquifer recharge are shown on Figure 3.

The Study focuses on evaluating benefits from current activities related to managed aquifer recharge because historical groundwater data are available and show conditions with these activities. Facilities that make up these activities include surface water reservoirs, pipelines, canals, pumping stations, recharge ponds, and recharge creeks. The Study differentiates between systems that can recharge both local runoff and imported water and systems that can recharge only local runoff because imported water is a distinct District activity with different costs. Groundwater users that benefit only from managed aquifer recharge systems that can recharge only local runoff do not benefit from managed recharge of imported water.

Planned indirect potable reuse involves managed aquifer recharge of purified water. Purified water produced by the Silicon Valley Advanced Water Purification Center (SVAWPC) with advanced oxidation meets or exceeds all California drinking water standards, including all potable reuse regulations for groundwater replenishment.

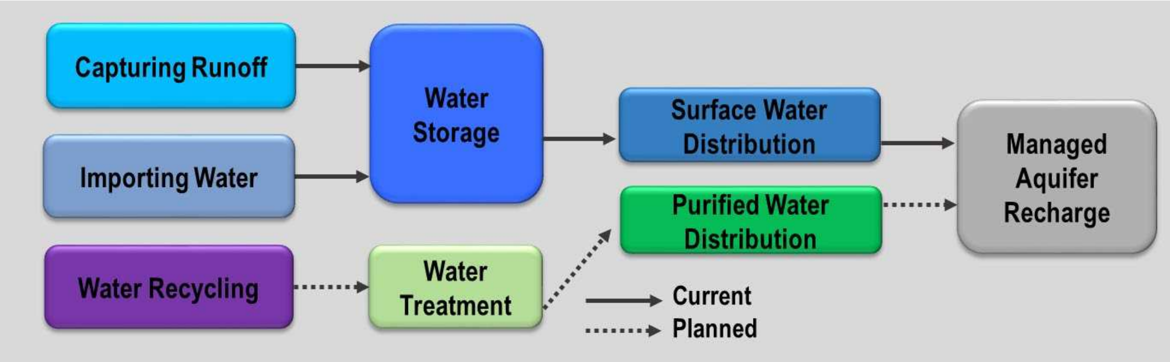


Figure 3. District Activities Supporting Managed Aquifer Recharge For Benefit of Groundwater Users

3.3 In-Lieu Recharge Activities

The District's direct delivery of water through various combinations of District activities, as shown on Figure 4, improves groundwater conditions by reducing groundwater extraction; this is referred to as in-lieu recharge. Demand management through water conservation programs also constitutes in-lieu recharge. Current groundwater pumping exceeds natural recharge, but without in-lieu recharge, groundwater pumping would also far exceed natural recharge and managed aquifer recharge combined, as further described in Section 6. By reducing groundwater pumping, in-lieu recharge provides benefits of improving groundwater levels thereby potentially improving groundwater supply reliability, preventing or limiting subsidence, and reversing or controlling salt water intrusion. Activities that support in-lieu recharge are shown on Figure 4.

The Study focuses on evaluating benefits from current activities related to treated water distribution because it is the largest type of in-lieu recharge provided by the District and historical groundwater data are available and they show conditions with these activities. Facilities that support treated water distribution include surface water reservoirs, canals, pump stations, treatment plants, and distribution pipelines.

The Study also evaluates recycled water distribution supported by the District and untreated surface water distribution by the District that provides in-lieu recharge.

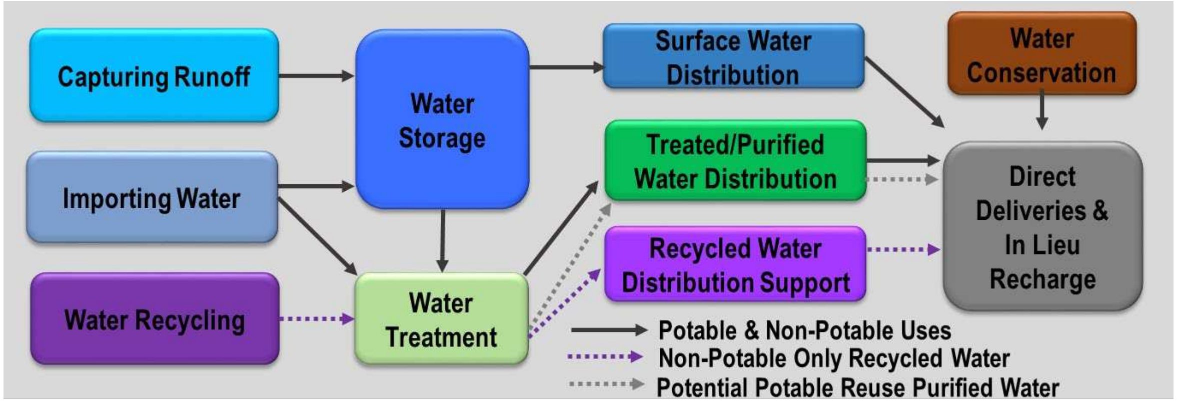

Capturing Runoff
Importing Water
Water Recycling
Water Storage
Water Treatment
Surface Water Distribution
Treated/Purified Water Distribution
Recycled Water Distribution Support
Water Conservation
Direct Deliveries & In Lieu Recharge
Potable & Non-Potable Uses
Non-Potable Only Recycled Water
Potential Potable Reuse Purified Water

Figure 4. District Activities Supporting In-Lieu Recharge for Benefit of Groundwater Users

3.4 Groundwater Protection Activities

Additional benefits are derived from the District's groundwater protection programs, which improve groundwater conditions by maintaining or improving groundwater quality. Protecting groundwater quality is inextricably linked to water supply reliability as groundwater with impaired quality will not be able to meet the uses of water supply. The District's groundwater protection activities include the following programs (SCVWD, 2016b):

- A free domestic well testing program for nitrates, which is offered to private well owners to help owners understand their water quality.
- Salt and nutrient management focused on reducing exposure to high nitrate concentrations, reducing additional nitrate and salt loading, managing nitrates and total dissolved solids (TDS) in groundwater, and monitoring salt and nutrient concentrations.
- Vulnerability assessments evaluating groundwater contamination risks.

- Coordination with land use agencies involving review of local land use plans, policies, and regulations in order to manage increased potential for groundwater contamination.
- Coordination with regulatory agencies to manage sites that pose a risk for releases of groundwater contaminants.
- Public outreach to educate the public on protecting the groundwater resource.

4 OVERVIEW OF BENEFITS FROM DISTRICT ACTIVITIES

Groundwater is a shared resource that can be represented by a water budget, which includes estimates of groundwater inflows (recharge) and outflows (pumping) and conjunctive use of surface water supplies within a given area. Improved groundwater conditions resulting from District groundwater management activities can be demonstrated by an improved water budget, i.e. groundwater conditions would be worse in the absence of District activities. An improved water budget represents the overall benefit of District managed aquifer recharge and in-lieu recharge activities that sustain an area's groundwater supply. As an example, District activities in calendar year 2013 resulted in 96,000 acre-feet of managed aquifer recharge by the District and 148,000 acre-feet of in-lieu recharge (treated water deliveries by the District and recycled water deliveries supported by the District) compared to 39,000 acre-feet of natural recharge (SCVWD, 2014). In addition, the District's conservation activities save approximately 64,000 acre-feet per year, based on 2015 estimates (SCVWD, 2016). District activities that result in an improved water budget provide the following benefits to groundwater users.

4.1 Improved Groundwater Supply Reliability

On average, groundwater accounts for 40% of the water used in Santa Clara County. Groundwater pumping (approximately 150,000 acre-feet in 2013) far exceeds natural recharge, and the District's managed and in-lieu recharge programs, including sustained and expanded conservation efforts, help replenish and sustain groundwater supplies. Figure 5 shows the rapidly growing population of Santa Clara County after World War II that was supported by a groundwater supply improved by District activities. This groundwater supply also supports high rates of business development and a viable agricultural economy. Community growth, quality of life and economic prosperity depend on a reliable and sustainable water supply that can be attributed to District groundwater management activities.

The Study uses historical groundwater level data and model results to evaluate improved groundwater supply reliability related to District activities.

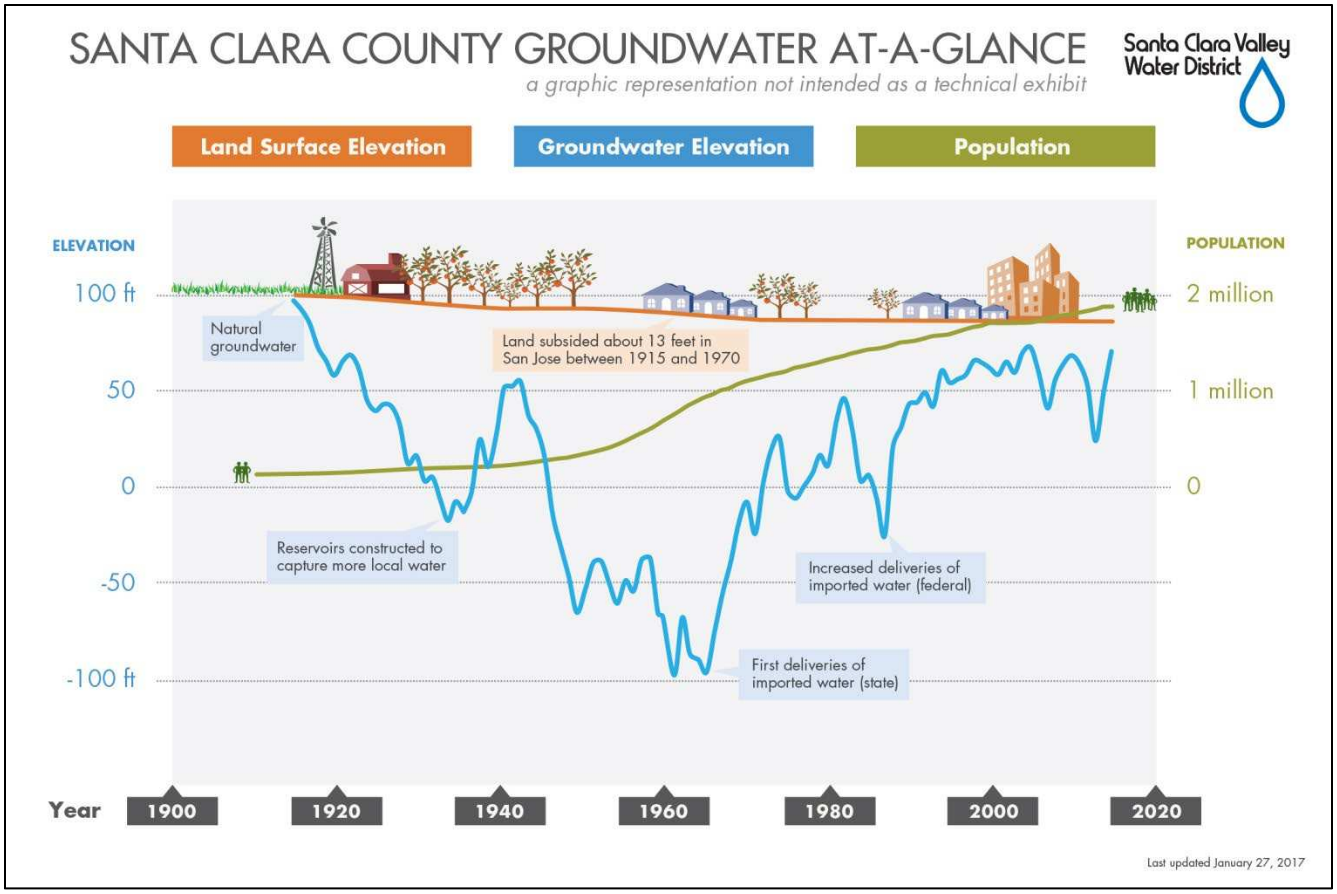
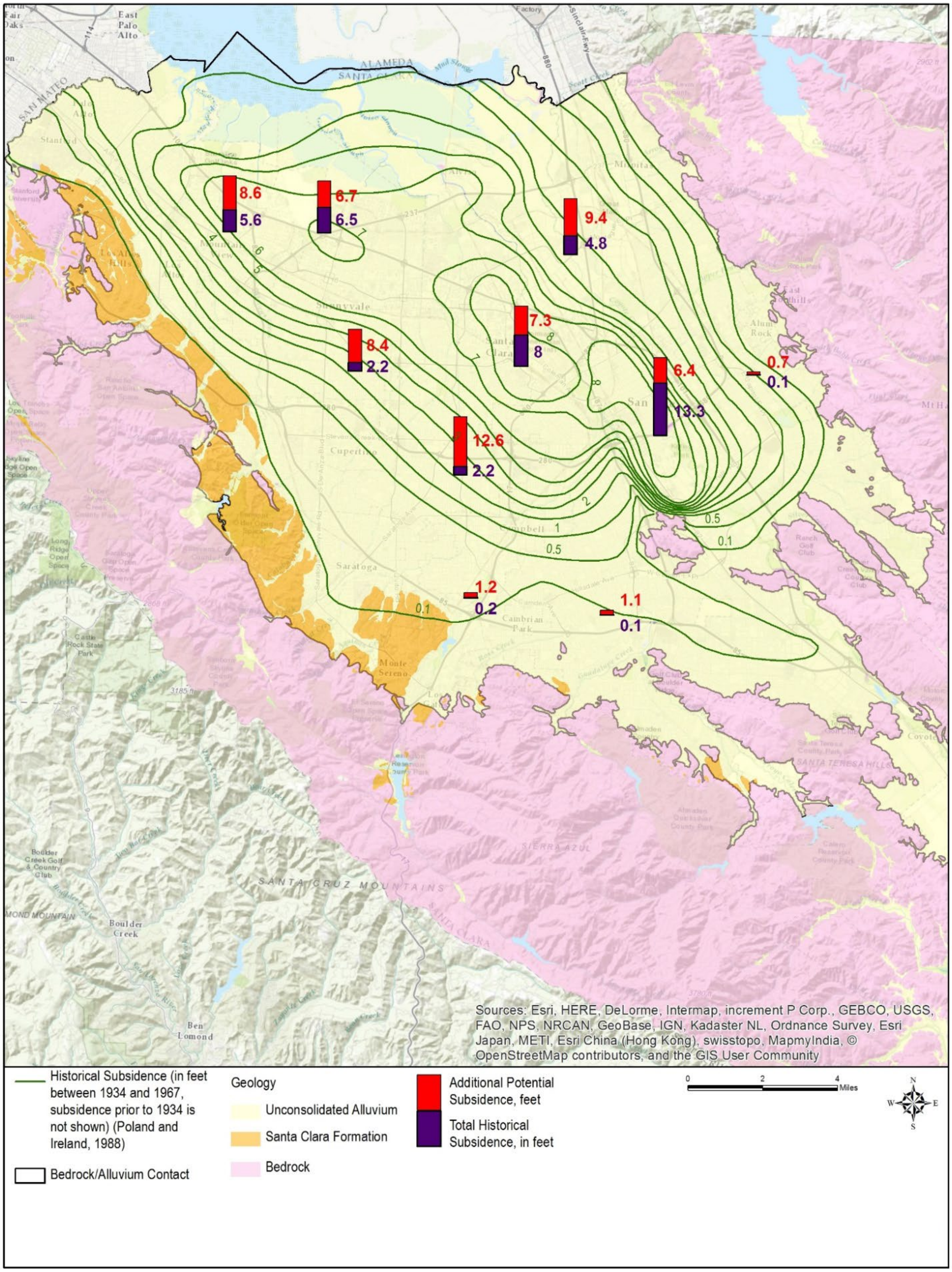


Figure 5. Graphic Representation of Groundwater Levels, Population and Land Subsidence (Courtesy SCVWD)

4.2 Reduced Risk of Land Subsidence

As shown on Figure 5 portions of the Santa Clara Valley subsided approximately 13 feet between 1915 and 1970 when groundwater pumping generally exceeded total recharge. During that time, there was at least a 1-foot drop in the land surface over a 100-square mile area including portions of Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose (Figure 6). Since then, permanent inelastic subsidence has been halted due to an improved water budget resulting from District activities (SCVWD, 2016). Subsidence can result in adverse effects such as damaged infrastructure, increased flooding risk, increased sediment erosion or deposition, and, where relevant, impairment of leveled agricultural fields. Therefore, preventing subsidence is a benefit of the improved water budget resulting from District activities. Figure 5 represents subsidence at one location (downtown San Jose) over time, but subsidence data over time at multiple locations are necessary to evaluate benefits over a broader area. Maps of subsidence are available only at specific times (Figure 6). Figure 6 also shows subsidence measured at extensometers, which shows subsidence halted before maximum subsidence could occur. Figure 6 shows the area where District activities provide the benefit of preventing subsidence. While it is clear that District activities have contributed to preventing subsidence and therefore support the area being part of a benefit zone, additional evaluation is required to associate the subsidence benefits to specific sets of District activities and account for other sources of recharge such as rainfall or in-lieu supplies of surface water from SFPUC Regional Water System (RWS). This additional evaluation may show that the subsidence benefits result from different District activities in different areas which would support defining multiple groundwater benefit zones for the area of subsidence benefits. As shown on Figure 5, raising groundwater elevations prevents subsidence so the Study uses historical groundwater level data and model results to evaluate benefits of preventing subsidence related to District activities.


8.6
5.6
6.7
6.5
9.4
4.8
7.3
8
8.4
2.2
6.4
13.3
0.7
0.1
12.6
2.2
1.2
0.2
1.1
0.1
0.5
0.1
1
2
Historical Subsidence (in feet between 1934 and 1967, subsidence prior to 1934 is not shown) (Poland and Ireland, 1988)
Bedrock/Alluvium Contact
Geology
Unconsolidated Alluvium
Santa Clara Formation
Bedrock
Additional Potential Subsidence, feet
Total Historical Subsidence, in feet
0
2
4
Miles
N
S
E
W

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Figure 6. Subsidence Contours with Geology

4.3 Salt Water Intrusion Prevention

Historically, denser salt water moved inland via creeks connected to the San Francisco Bay then infiltrated groundwater when groundwater pumping exceeded natural recharge and subsidence resulted in greater tidal influence on the creeks connected to the bay (SCVWD, 2016b). Figure 7 shows the inland migration of salt water in the shallow aquifer zone from 1945 to 1980. Figure 7 additionally illustrates the reversal of salt water intrusion in the shallow zone from 1980 to 2015. Although salt water intrusion has been observed only in a small portion of the deeper aquifer zone that provides groundwater supply (SCVWD, 2016), salt water intrusion would represent a risk to the groundwater quality of the deeper groundwater supply due to potential for inter-aquifer transfer through improperly destroyed wells or other borings. Reducing this risk to groundwater quality improves the reliability of groundwater supply. Therefore, preventing salt water intrusion is a benefit of the improved water budget from District activities.

Maps of salt water intrusion are available only at the specific times shown on Figure 7. This figure shows areas where District activities provide the benefit of reducing salt water intrusion. Both managed aquifer recharge and treated water deliveries have helped raise groundwater levels in areas subject to saltwater intrusion; however, additional evaluation is required to associate those benefits to specific sets of District activities and account for other sources of recharge such as rainfall or in-lieu supplies of water from SFPUC RWS. Raising groundwater elevations is the mechanism for reducing salt water intrusion so the Study uses historical groundwater level data and model results to evaluate benefits of reducing saltwater intrusion related to District activities.

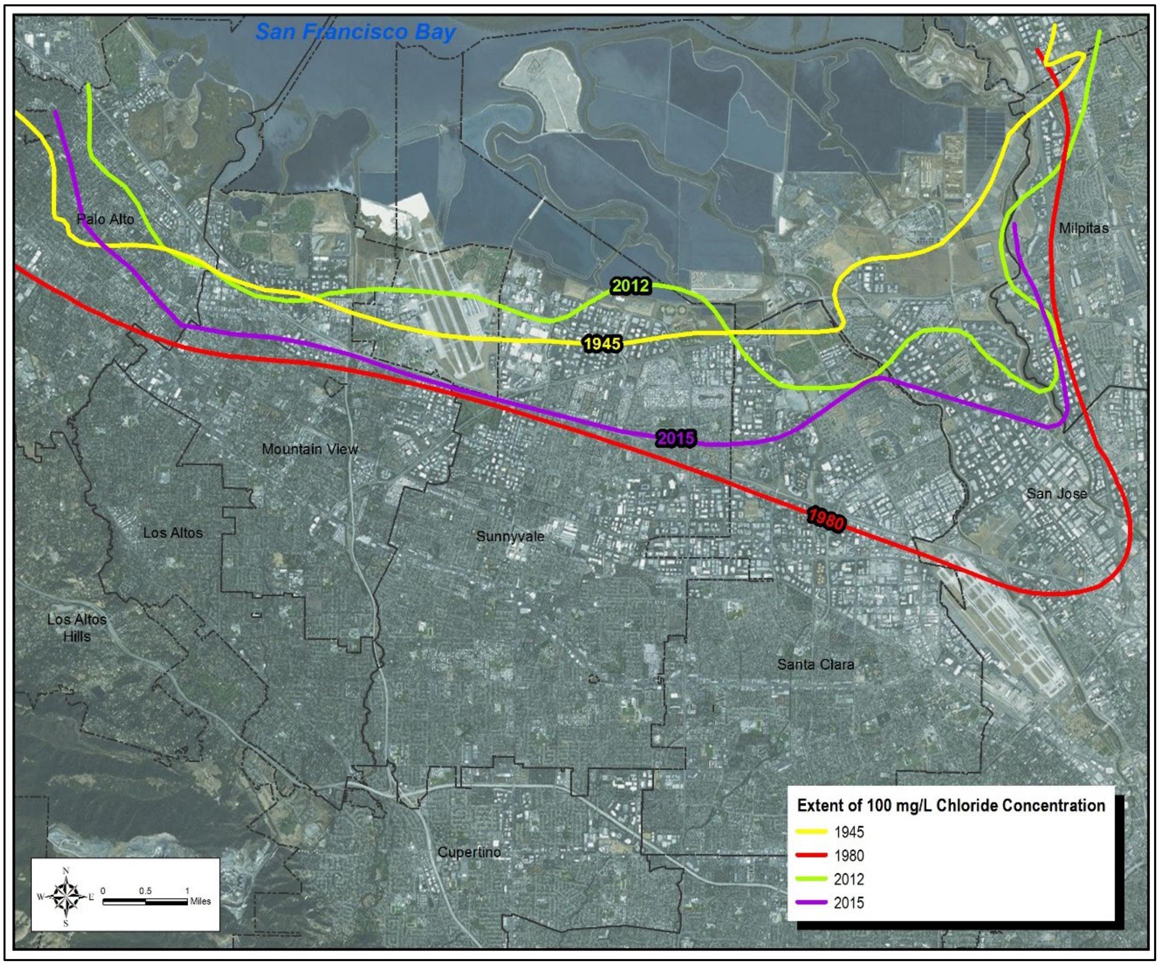


Figure 7. Extent of Shallow Zone Salt Water Intrusion

4.4 Improved Groundwater Quality

Recharge water can be of higher quality than the ambient groundwater so an improved water budget from District activities can also improve groundwater quality. For example, nitrate concentrations are high in ambient groundwater in portions of the Llagas Subbasin, but imported water used for managed aquifer recharge has a dilution benefit by adding water with low nitrate concentrations to the water budget (MACTEC, 2009). SCVWD’s study of nitrate in domestic wells in the Llagas Subbasin found that 14% of wells within 2,000 feet of District recharge facilities exceeded the nitrate maximum contaminant limit (MCL), while 40% of wells tested in all other areas exceeded the MCL (SCVWD, 2012). These groundwater quality benefits from specific District recharge activities generally cover a smaller area than benefits represented by groundwater level changes so this smaller area of water quality benefits do not represent the entire area benefiting from the specific activities.

Groundwater protection activities also conserve and improve groundwater quality. Maintaining groundwater quality improves the reliability of the groundwater supply to meet drinking water standards, irrigation quality requirements, and quality needs of other uses. These activities are distributed widely through the District's service area and benefit the entire subbasin. In general, since all groundwater users benefit from these groundwater protection measures, the Study does not focus on groundwater quality for defining groundwater benefit zones.

4.5 Water Reuse Benefits

The District partners and collaborates with recycled water producers, wholesalers, retailers, users, and other interested parties to develop and expand recycled and purified water within the County. Increasing recycled and purified water benefits County groundwater supplies by alleviating stress on existing potable water supply infrastructure during droughts, and provides an alternative local, drought-proof, and reliable water supply to the County.

Some of these partnerships include four agencies that produce recycled water in the County (Palo Alto/Mountain View Recycled Water System, South Bay Water Recycling Program [SBWRP], South County Regional Wastewater Authority [SCRWA], and City of Sunnyvale Recycled Water System) along with other stakeholders. The District is developing a Countywide Water Reuse Master Plan (CWRMP) to identify future potential stakeholder partnerships and determine the institutional agreements needed to advance recycled and purified water. The vision of the CWRMP is a collaborative strategy to integrate and expand recycled and purified water as a local, reliable, environmentally adaptive, drought-proof water supply and guide strategic investment of public funds over the next 20 years.

5 HYDROGEOLOGICALLY CONNECTED AREAS

District activities provide groundwater benefits beyond the immediate location of an activity. Groundwater flow patterns control how benefits extend beyond the activity locations. The Study maps hydrogeologic features that affect groundwater flow to define areas hydrogeologically connected to District activities. Mapped features include contacts between water-bearing sediments and bedrock, and the location of groundwater divides separating subbasins. Other geologic features that may define the limits of hydrogeologic connection include faults, where alluvium narrows and/or steepens, and contacts between geologic formations with different levels of consolidation. The boundaries for the hydrogeologically connected areas are based on some of these features.

5.1 Alluvium Contact with Bedrock

The hydrogeologically connected areas are primarily defined by the geologic contact between unconsolidated to semi-consolidated alluvium and consolidated bedrock of the adjacent mountain ranges. Alluvium are primarily sediments that eroded from adjacent mountain ranges by flowing water and deposited in the Valley during the current geologic age (Quaternary age) that began approximately 2.6 million years ago. The bedrock of the adjacent Santa Cruz Mountains and Diablo Range are primarily composed of sedimentary, metamorphic, and volcanic rocks formed in Jurassic, Cetaceous, and Tertiary periods older than 2.6 million years ago (SCVWD, 2016). In addition to bounding the hydrogeologically connected areas of alluvium laterally, bedrock underlies the alluvium (Figure 8).

Alluvium includes fine sediments of silt and clay and coarser sediments of sand and gravel. Groundwater flows through spaces (pores) in these sediments. Groundwater generally flows through the pores of the alluvium until encountering bedrock or other hydrogeologic boundaries so continuous areas of alluvium are generally hydrogeologically connected. This groundwater flow through porous media provides greater potential for connecting areas with groundwater users to benefits from District activities than in bedrock. Bedrock is consolidated so groundwater flow typically occurs in bedrock fractures that have not been mapped and may be limited in extent. District activities can benefit the groundwater supply of these fractures, but the extent of the benefit would be limited by the unknown extent of fractures. Therefore, the bedrock/alluvium contact within Santa Clara County is the basis for the hydrogeologically connected areas used to define the extent of potential benefit. Quaternary deposits and artificial fill mapped at the surface that are not specifically labeled alluvium are included in the Study's definition of alluvium because they are relatively young (< 2.6 million years) deposits and are relatively permeable compared to the older bedrock that bounds the basin.

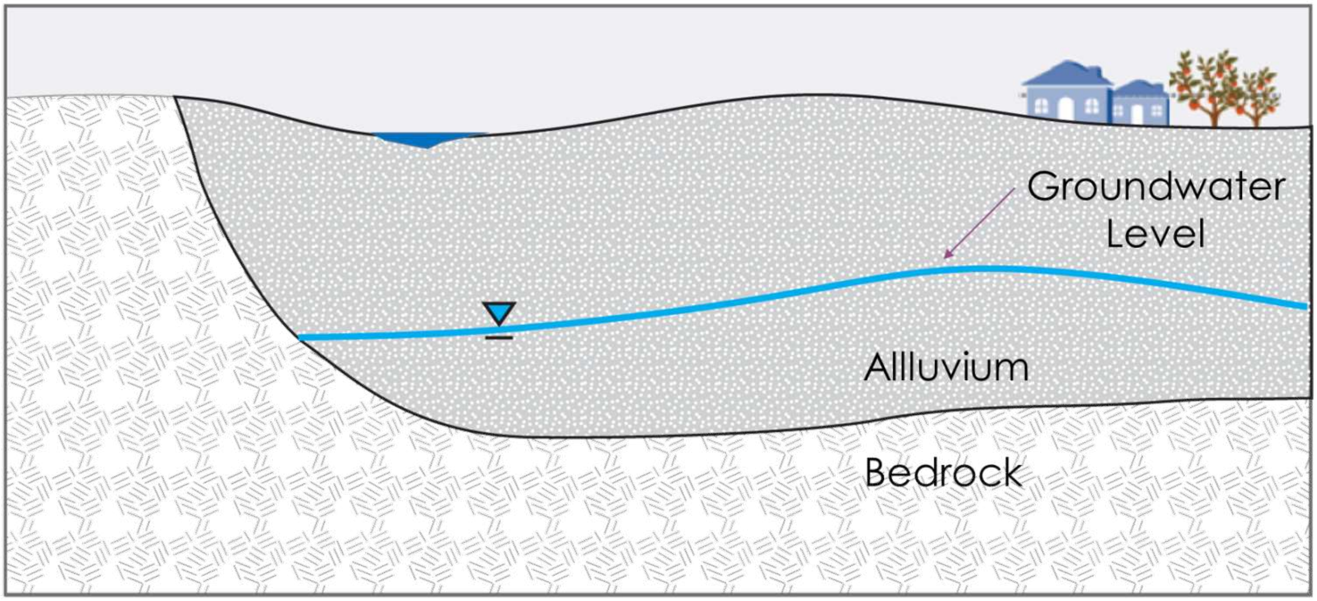


Figure 8. Schematic Cross-Section of Alluvium and Bedrock

5.1.1 Geologic Maps

The bedrock/alluvium contact is based on existing maps by the U.S. Geological Survey (USGS) and California Geological Survey (CGS). The Study uses GIS formats of these maps that were downloaded from USGS websites.

Two 30 x 60-minute quadrangles are used for this study: Palo Alto (Brabb et al., 2000) and San Jose (Wentworth et al., 1999). The Palo Alto quadrangle covers the northwestern portion of the County from Stanford to Saratoga, with its eastern boundary just west of the North-South Lawrence Expressway. The San Jose quadrangle covers the County from the Palo Alto quadrangle to West 10th St/Highway 152 in Gilroy in the Llagas subbasin. Maps of Quaternary deposits for the San Francisco Bay Region (Witter et al., 2006) are used to cover the rest of the County to the South. Even though it covers the whole County, this regional map has more generalized groupings of geologic formations, so the more detailed Palo Alto and San Jose quadrangles are used where available. Figure 9 shows the unified geology from all three maps used in this study.

The listed scale of the Palo Alto quadrangle is 1:62,500 and the listed scale of the San Jose quadrangle and regional map is 1:24,000. The USGS accuracy standard requires that 90% of known points must be within 0.02 inches on the map. For 1:24,000 scale, this translates to an accuracy of 40 feet and for 1:62,500, this translates to an accuracy of approximately 105 feet. However, geologic maps involve interpretation between known points and interpretation likely results in some additional inaccuracies.

5.1.2 Alluvium Formations

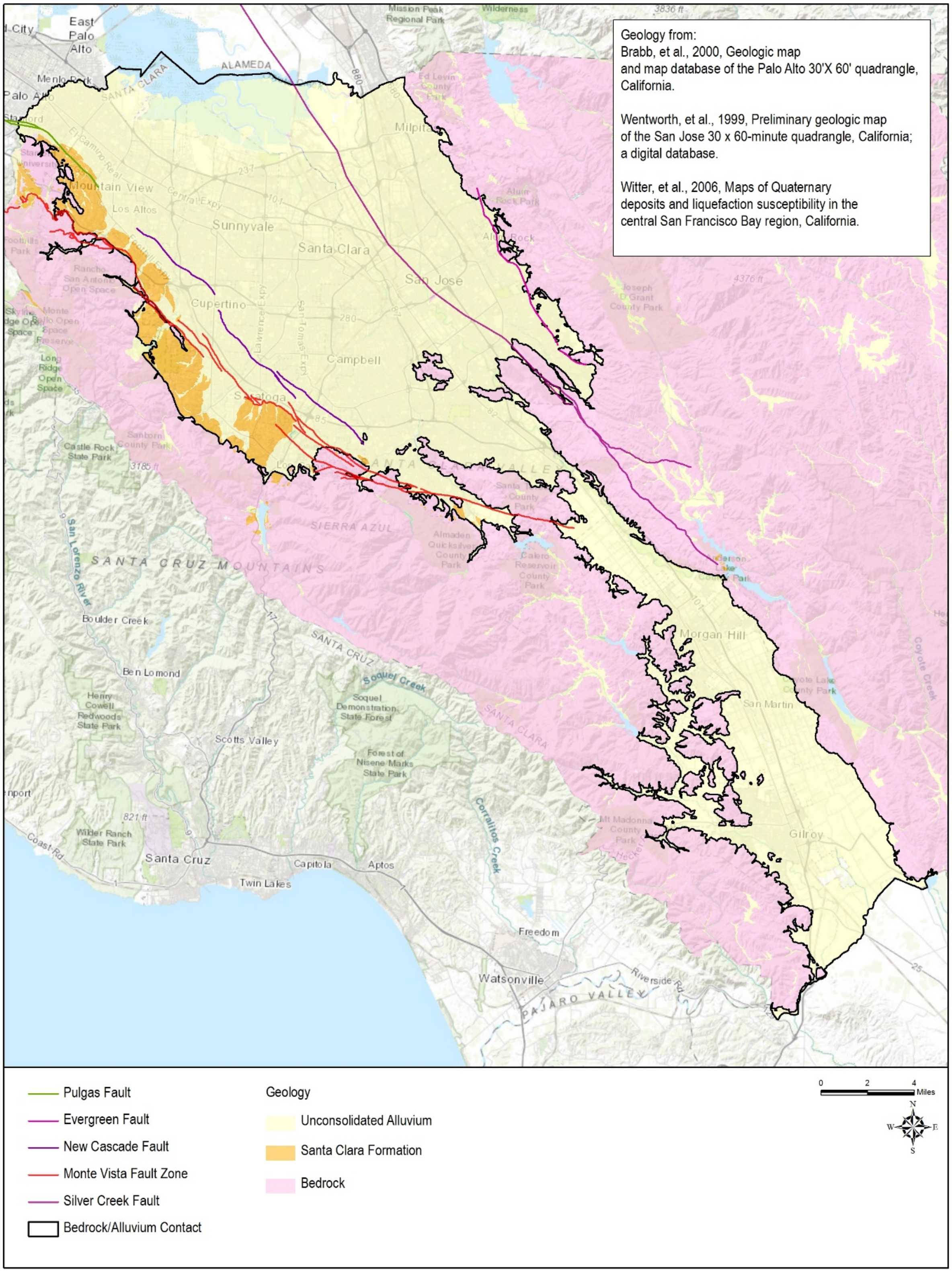
Alluvium in Santa Clara County primarily consists of unconsolidated sediments, lenses of clay, silt, sand, and gravel deposited in the Holocene (younger than 12,000 years old) and Pleistocene epochs (12,000 to 2.6 million years ago), that this report refers to as Unconsolidated Alluvium. Unconsolidated Alluvium is mapped from the northern to the southern boundary of Santa Clara County. Figure 9 distinguishes Unconsolidated Alluvium from the slightly older Santa Clara Formation located on the west side of the Santa Clara Plain. The Santa Clara Formation consists of slightly consolidated or semi-consolidated alluvium deposited during the early Pleistocene and Pliocene epochs (2.6 million to 5.8 million years ago). Groundwater flow through Unconsolidated Alluvium and Santa Clara Formation is through porous media but permeability of Santa Clara Formation is less certain than Unconsolidated Alluvium. Section 5.6 provides additional discussion of hydrogeologic connection in the Santa Clara Formation and between Unconsolidated Alluvium and Santa Clara Formation

5.2 Groundwater Divide

Groundwater divides occur between areas where groundwater flows in opposite directions. The primary groundwater divide in the County is the divide at the southern end of Coyote Valley that is used by the California Department of Water Resources (DWR) to define the boundary between the Santa Clara and Llagas Subbasins (DWR, 2003). North of this divide, groundwater flows to the north. South of this divide, groundwater flows to the south.

The groundwater divide changes slightly over time based on recharge and pumping conditions, so groundwater contours maps developed by the District for 1975-2015 were reviewed. Figure 10 shows spring and fall groundwater contours from 2000-2002 and Figure 11 shows spring and fall groundwater contours from 2013-2015 for years when the District developed groundwater contours for the area of the groundwater divide in GIS format. The contours affirm that the DWR basin boundary is a representative approximation of the groundwater divide over time and an appropriate boundary for hydrogeologically connected areas used to define the extent of potential benefit.

The contour maps also show that other groundwater divides may appear seasonally but are not consistent throughout the year. For example, in the spring, the north part of the County has a divide between flow north toward the Bay and south towards pumping depressions, but this divide is not maintained throughout the year and does not establish a boundary for hydrogeologically connected areas. A consistent groundwater divide other than the subbasin boundary is also not evident in historical contour maps created by the District for 1975-1999.



Geology from:
Brabb, et al., 2000, Geologic map and map database of the Palo Alto 30'X 60' quadrangle, California.

Wentworth, et al., 1999, Preliminary geologic map of the San Jose 30 x 60-minute quadrangle, California; a digital database.

Witter, et al., 2006, Maps of Quaternary deposits and liquefaction susceptibility in the central San Francisco Bay region, California.

Figure 9. Geology of Santa Clara County

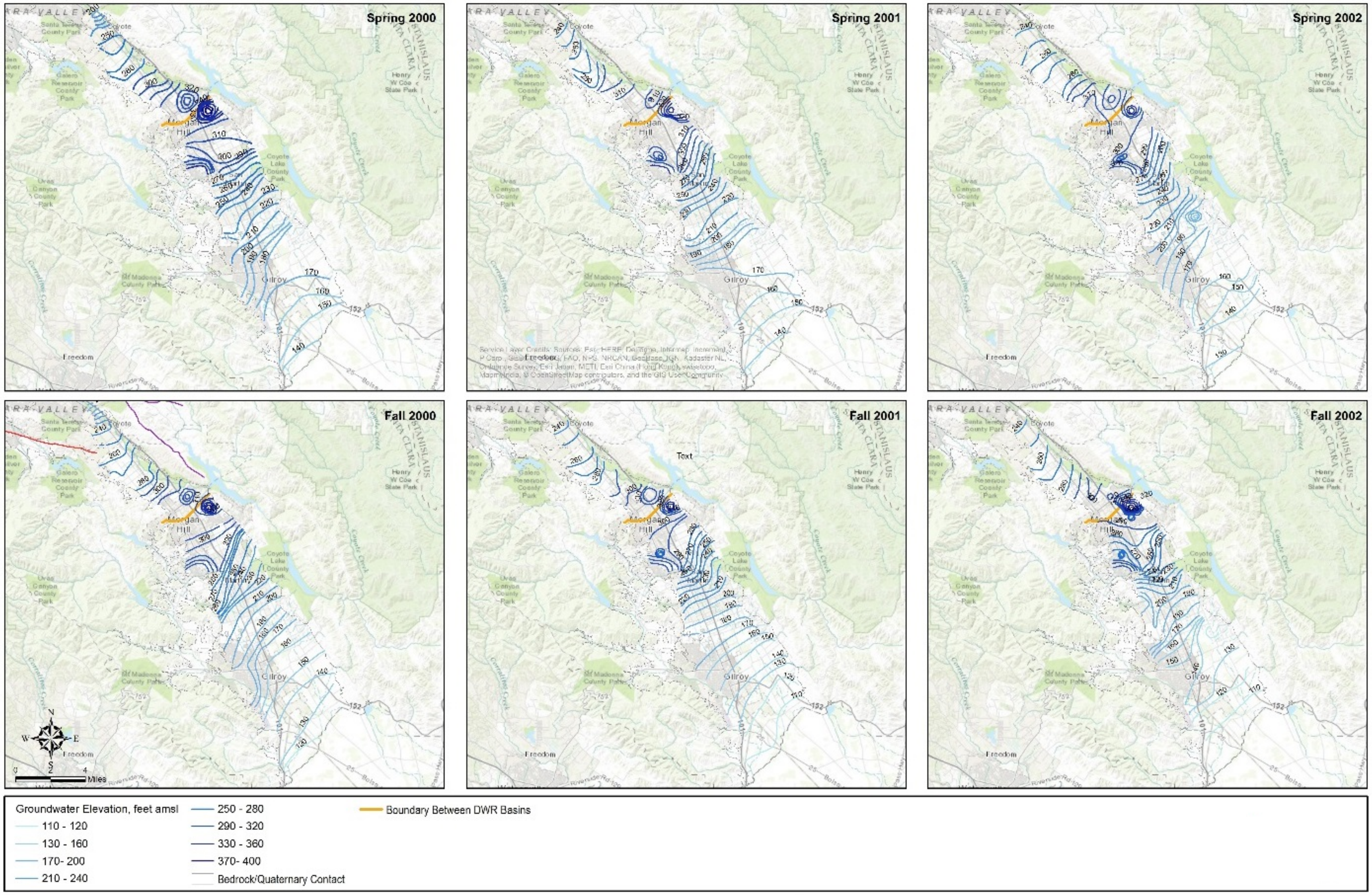


Figure 10. Spring and Fall Groundwater Elevation Contours for Coyote Valley and Llagas Subbasin 2000-2002

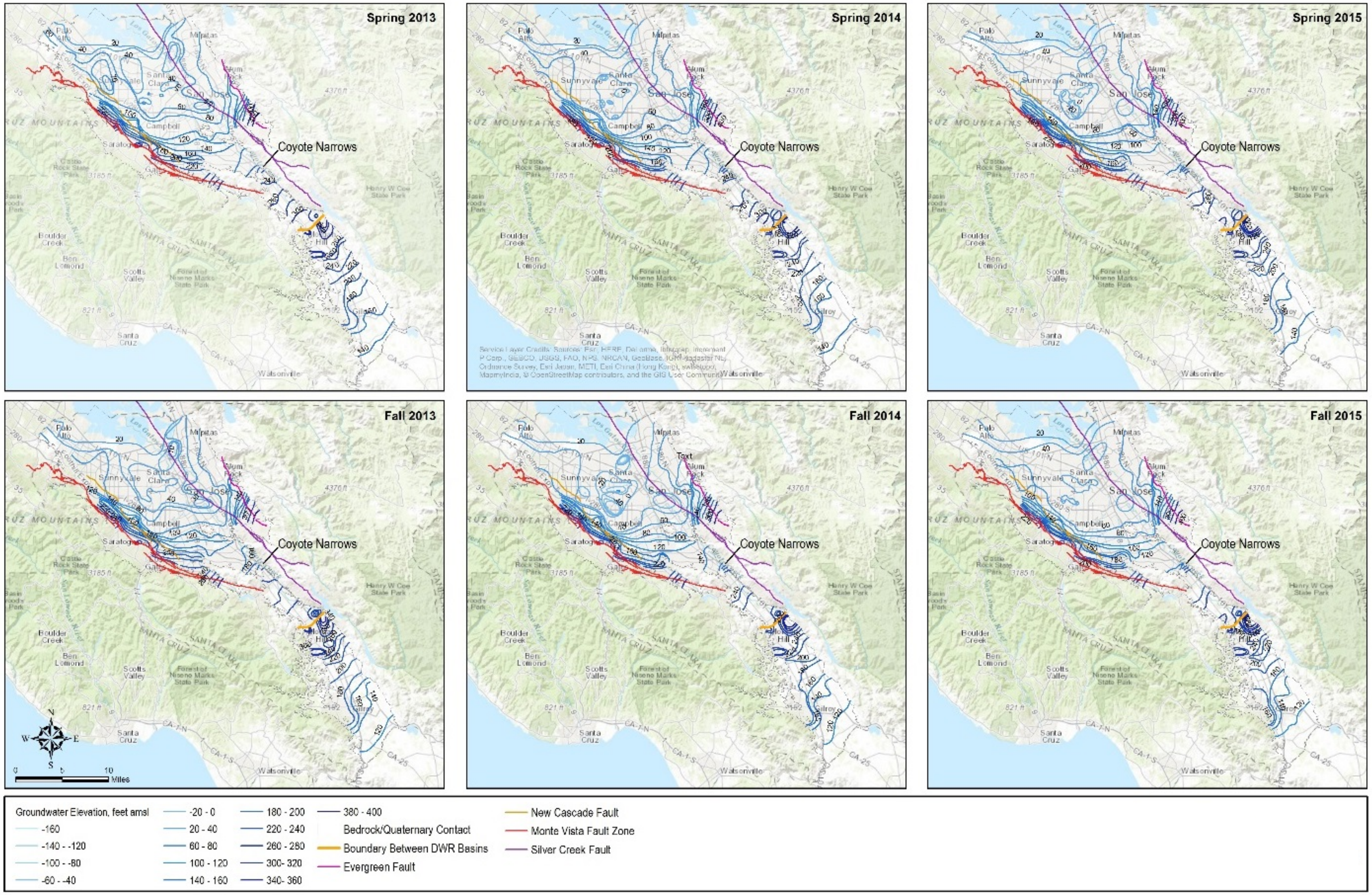


Figure 11. Spring and Fall Groundwater Elevation Contours for Santa Clara Subbasin 2013-2015

5.3 Faults

Faults can be barriers to groundwater flow. However, mapped faults are not necessarily definitive and significant barriers to flow that limit the extent of benefits from District activities. Previous studies identified the faults that are most likely to be significant barriers to flow. This Study evaluates whether these faults are significant barriers to flow by comparing fault locations with the groundwater level contour maps. The Study assigns faults previously identified as possible barriers to groundwater flow as hydrologic boundaries if the extent of District activity benefits, as estimated by the groundwater level evaluation (Section 8) and modeling evaluation (Section 9), indicate benefits may be limited by the fault.

Fault locations that may be flow barriers were derived from a number of studies. The most recent USGS study of the hydrogeology of the Santa Clara Plain (Wentworth et al., 2015) identifies several faults as at least partial barriers to groundwater flow. Interferometric synthetic-aperture radar (InSAR) imagery indicates a subsidence boundary at the Silver Creek Fault in the eastern part of the subbasin (Galloway et al., 2000). Hanson et al. (2004) includes three segments of this fault and the nearby North Evergreen Fault as horizontal flow barriers in a groundwater model. Based on the model calibration, the greatest barriers to flow in this area are two southern segments of the Silver Creek Fault in layers 3-6 in the model where layers 3-5 represent the confined unit in the subbasin from which most production occurs (CH2M Hill, 1992). However, there is a gap included in the fault near Coyote and Silver Creeks to simulate stream recharge across the fault.

Hanson et al. (2004) also simulates the Monte Vista and New Cascade Faults as horizontal flow barriers in model layers 3-6 to reduce groundwater levels in the central part of the subbasin. The model also includes gaps at District managed recharge facilities Ross Creek and Stevens Creek of the West Side system and Los Gatos Creek to simulate stream recharge across the fault.

Groundwater level contours for 2013-2015 (Figure 11) developed by the District do not indicate a barrier to groundwater flow across these faults based on GIS files produced by the USGS and CGS (2010). However, the contours do not extend west of the Monte Vista Fault into the mapped outcrop of the Santa Clara Formation (Section 5.6).

Given there is inconsistent information about whether these faults are barriers to groundwater flow, and there is likely some flow across the faults, faults are identified as boundaries only if benefits from a District activity are only demonstrated on one side of the fault.

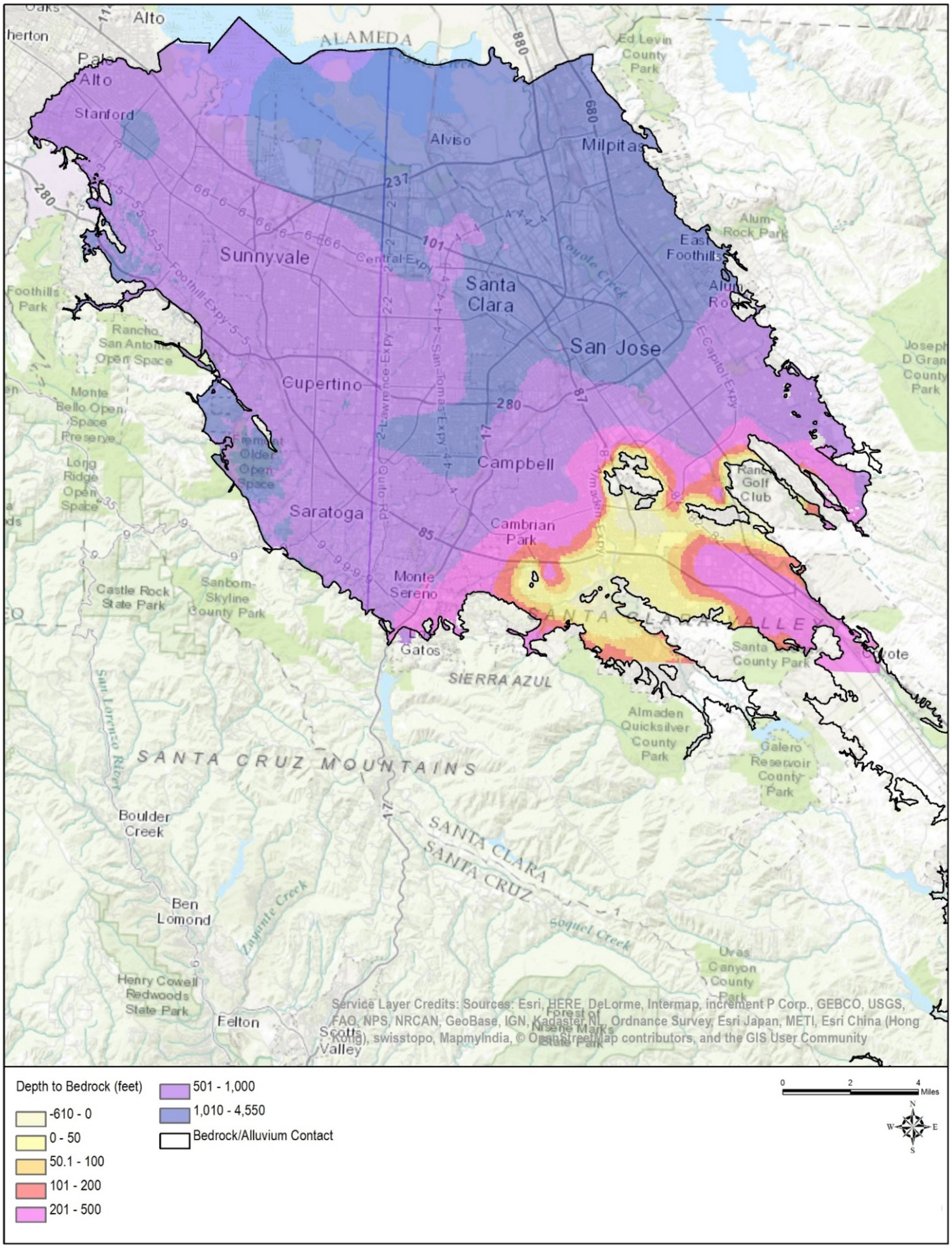
Wentworth et al. (2010) evaluates evidence for other historically inferred faults in the basin and concludes most of those previously identified faults do not extend into the alluvium of the subbasin. No faults have been identified as barriers to groundwater flow in the alluvium of Coyote Valley and the Llagas Subbasin.

5.4 Stratigraphic Thickness

The Study uses interpreted stratigraphy to map the thickness of the alluvium including Unconsolidated Alluvium and Santa Clara Formation. Large changes in thickness or stratigraphy could be geologic features that affect how groundwater flows between areas. If the thickness decreases over a small distance, groundwater flow can be constricted and limit the hydrogeologic connection across the change in thickness. The Study calculates and maps depth to bedrock in the alluvium of the Santa Clara Plain (Figure 12) based on GIS files for bedrock elevation developed by Wentworth et al. (2010) and ground surface elevation based on the USGS Digital Elevation Model. The 2015 USGS report (Wentworth et al., 2015) identifies continuous sedimentary stratigraphy from San Jose to the Palo Alto area

While the map of stratigraphic thickness shows an area of thinner Unconsolidated Alluvium in the area north of Coyote Narrows, groundwater level contours do not show that it affects groundwater flow (Figure 11). The area of reduced thickness is not considered a limit on the area of hydrogeologic connection.

Although similar data sets are not available for the Coyote Valley and Llagas management areas, depths implemented in the model do not show substantial changes in thickness over short distances and groundwater contour maps do not indicate a constriction of flow due to thickness changes.



Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Figure 12. Depth to Bedrock Based on USGS Stratigraphy (Wentworth et al., 2015)

5.5 Constrictions of Unconsolidated Alluvium

A geologic feature that may affect hydrogeologic connectivity occurs when the Unconsolidated Alluvium constricts between bedrock outcrops. Even though groundwater flow may occur through such a constriction, the constriction may have enough effect that the hydrogeologic connection transmitting benefits from District activities is limited.

5.5.1 Coyote Narrows

The existing boundary between Zones W-2 and W-5 is located at the Coyote Narrows between the Santa Clara Plain and Coyote Valley. Groundwater level contour maps (Figure 11) show a steep gradient in this area. This indicates that the constriction is affecting groundwater flow substantially and may limit hydrogeologic connection across the boundary. The existing zone boundary may approximate a boundary for hydrogeologically connected areas if benefits from a District activity are only demonstrated on one side of the Narrows.

5.5.2 Bedrock Outcrops in Llagas Subbasin

There are several bedrock outcrops in the Llagas Subbasin that may affect the hydrogeologic connection of Unconsolidated Alluvium within Llagas Basin (Figure 13). Similar to Coyote Narrows, these bedrock outcrops may constrict groundwater flow through Unconsolidated Alluvium thereby limiting hydrogeologic connection. These narrow Unconsolidated Alluvium connections which may be appropriate to use as a boundary if benefits from a District activity are only demonstrated on one side of the outcrop constrictions. Groundwater level maps are not available to show gradients across these constrictions.

5.5.3 Narrow Alluvial Channels

Another constriction of Unconsolidated Alluvium is where narrow and steep streambed alluvium channels flow through bedrock areas into downstream areas of Unconsolidated Alluvium. The constriction may limit the hydrogeologic connection between activities in the downstream areas with the upstream channel. Therefore, the constrictions may be appropriate to use as a boundary. Groundwater level maps are not available to show gradients across these constrictions, but stream elevations in connection with groundwater in the shallow alluvial channels are typically much higher than groundwater levels in the downstream areas. Ground surface elevations and data for alluvial thicknesses can be used to evaluate where this limitation on hydrogeologic connection occurs.

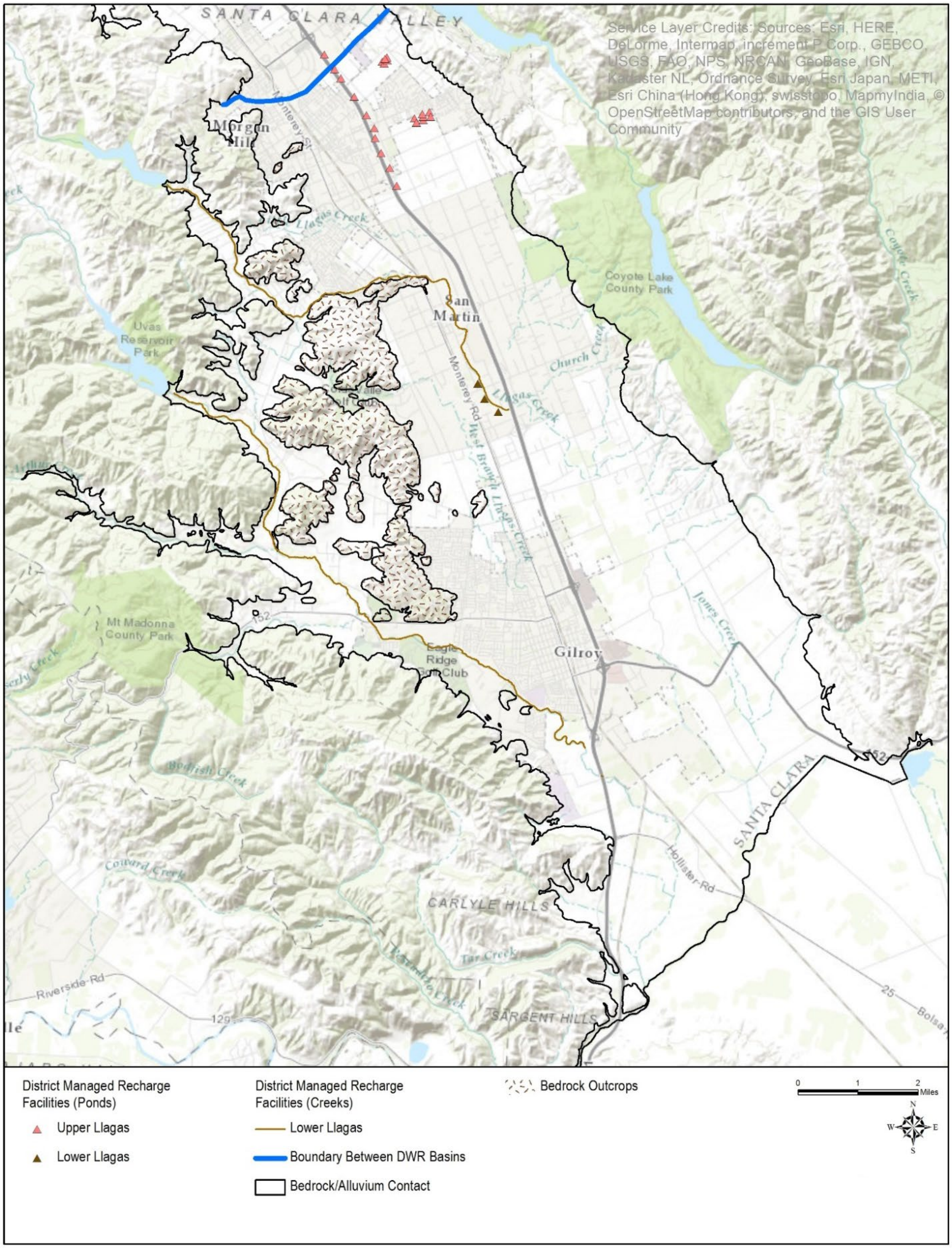


Figure 13. Locations of Bedrock Outcrop Constrictions in Llagas Subbasin

5.6 Santa Clara Formation

Descriptions of the water bearing alluvium in the Santa Clara Plain distinguish between the Santa Clara Formation of Plio-Pleistocene age and the other Pleistocene-Holocene deposits referred to in this report as Unconsolidated Alluvium. DWR's description of the Santa Clara Subbasin describes the Unconsolidated Alluvium as the more important water bearing unit for the subbasin (DWR, 2003). Figure 14 shows the largest surface outcrop of the Santa Clara Formation on the west-side of the subbasin where it has been described as "poorly sorted, irregularly bedded material ranging in grain size from silt to boulders" (DWR, 1975). Other studies have described the Santa Clara Formation as partly non-water bearing in this outcropping area (Wentworth et al., 2015), however there are wells that extract groundwater throughout this area as shown on Figure 14. Pumping data are available for wells in the outcropping area of the Santa Clara Formation that are also within current Zone W-2 and production for 2015 totaled 557 acre-feet. In addition, the description of the Santa Clara Formation indicates that groundwater flow is flow through pore spaces in the Formation materials, not through fractures as in bedrock. It is reasonable to consider connected areas of the Santa Clara Formation as hydrogeologically connected though there is a lack of data that can be evaluated for hydrogeologic connection beyond mapping of geology and pumping wells in the area.

There is a lack of information documenting a hydrogeological connection between the Santa Clara Formation and the Unconsolidated Alluvium. In addition, the previous presumption that the Santa Clara Formation underlies Unconsolidated Alluvium towards the center of the basin (DWR, 1975) has been questioned by Wentworth et al. (2015) who concluded that there is little evidence for its existence much closer to the center of the basin than the surface outcrops shown on Figure 14. Therefore, it is not reasonable to conclude that there is a hydrogeologic connection between the Santa Clara Formation and Unconsolidated Alluvium. Benefits from District activities to extend from one geologic formation to the other must be demonstrated by data and modeling, if available.

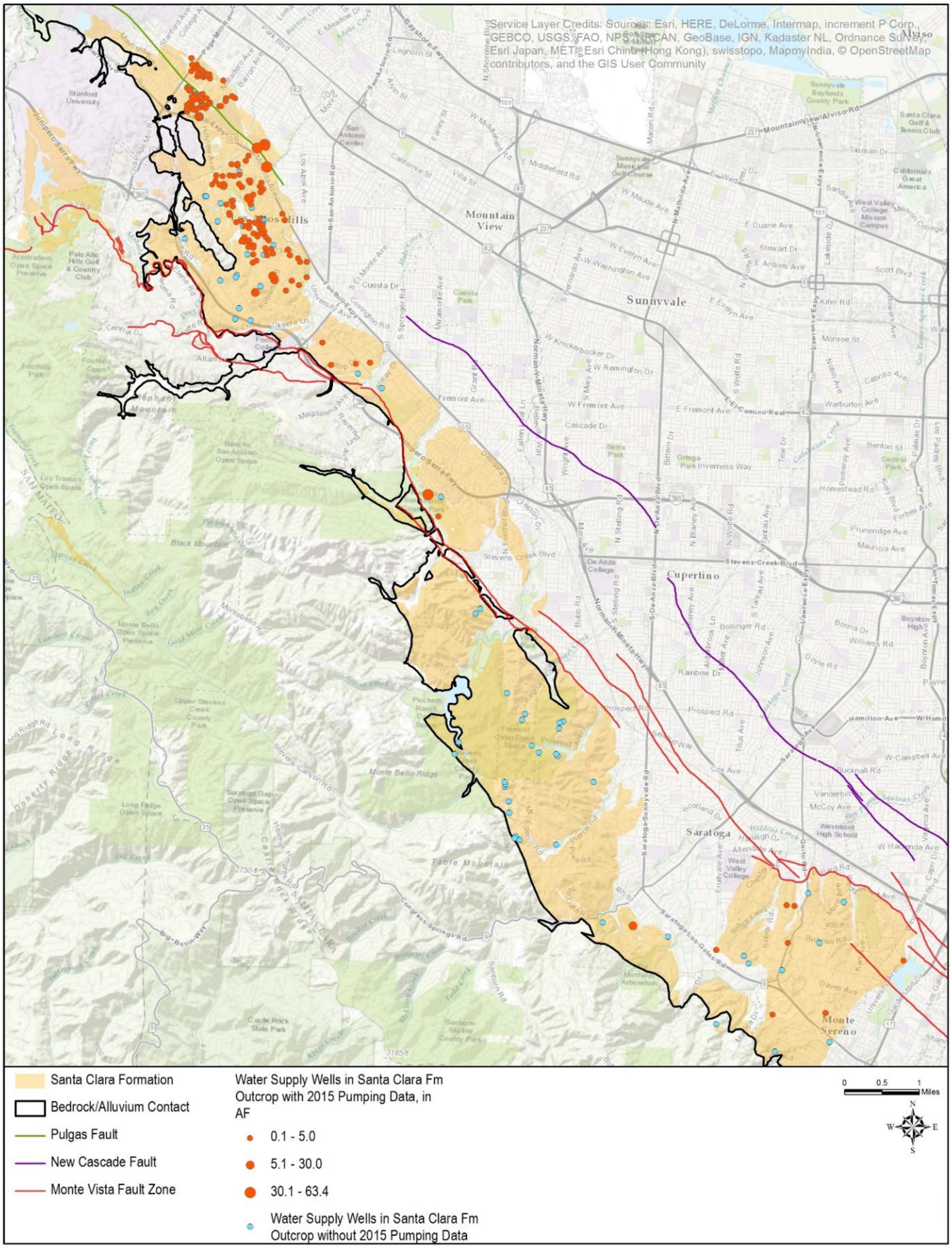

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Stanford University
Los Altos Hills
Mountain View
Sunnyvale
Cupertino
Saratoga
Monte Sereno
Alviso
Black Mountain
Table Mountain
Monte Bello Ridge
Long Ridge
SAN MATEO
SANTA CLARA
Santa Clara Formation
Bedrock/Alluvium Contact
Pulgas Fault
New Cascade Fault
Monte Vista Fault Zone
Water Supply Wells in Santa Clara Fm Outcrop with 2015 Pumping Data, in AF
0.1 - 5.0
5.1 - 30.0
30.1 - 63.4
Water Supply Wells in Santa Clara Fm Outcrop without 2015 Pumping Data
0
0.5
1
Miles
N
W
E
S

Figure 14. Santa Clara Formation Outcrop along Westside of Santa Clara Subbasin

6 BENEFITS TO WATER BUDGET IN HYDROGEOLOGICALLY CONNECTED AREAS FROM DISTRICT ACTIVITIES

Water budgets for potentially hydrogeologically connected areas demonstrate the general benefits from the District’s managed and in-lieu groundwater replenishment activities. The potentially hydrogeologically connected areas are based on the Bedrock/Alluvium contact and the groundwater divide that is DWR’s boundary between subbasins. Plots of water budgets are provided for the Santa Clara Subbasin including Santa Clara Plain and the Coyote Valley and the Llagas Subbasin. The plots show need for District groundwater replenishment activities, benefit from managed aquifer recharge activities, and benefit from in-lieu recharge activities.

6.1 Need for District Groundwater Replenishment Activities

Natural recharge is not sufficient to support groundwater pumping in the subbasins. Figure 15 compares annual natural recharge to annual groundwater pumping in the Santa Clara Subbasin. Since 2003, groundwater pumping has been approximately three times the natural recharge for the Santa Clara Subbasin. Figure 16 compares annual natural recharge to annual groundwater pumping in the Llagas Subbasin. Since 2003, groundwater pumping has been approximately two times the natural recharge for the Llagas Subbasin. Groundwater replenishment activities are needed to balance groundwater pumping with total recharge for both subbasins. If groundwater pumping were to exceed recharge, groundwater levels would decline, resulting in less reliable groundwater supply and increased risk of land subsidence and saltwater intrusion. The plots show that groundwater replenishment activities are needed in all years.

6.2 Benefits to Water Budget from Managed Aquifer Recharge Activities

District managed aquifer recharge activities provide benefits to the subbasin water budget by making up most of the difference between groundwater pumping and natural recharge. Figure 17 and Figure 18 stack annual volumes of District managed aquifer recharge on top of natural recharge in order to compare total recharge with groundwater pumping in each of the subbasins. By helping to balance total recharge with groundwater pumping and improving groundwater levels, these managed aquifer recharge activities provide benefits of a more reliable groundwater supply and reduced risk of land subsidence and saltwater intrusion. Since pumping exceeds natural recharge in all years, District managed aquifer recharge always provides the benefit of balancing recharge and pumping.

Figure 17 includes managed recharge at the following systems that can recharge both imported water and local runoff to benefit the Santa Clara Subbasin water budget:

- West Side
- Los Gatos
- Guadalupe
- Coyote
- Penitencia

Figure 18 includes managed recharge at the following systems to benefit the Llagas Subbasin water budget:

- Upper Llagas system that can recharge both imported water and local runoff
- Lower Llagas system that recharges only local runoff captured and stored in the District's Uvas and Chesbro Reservoirs

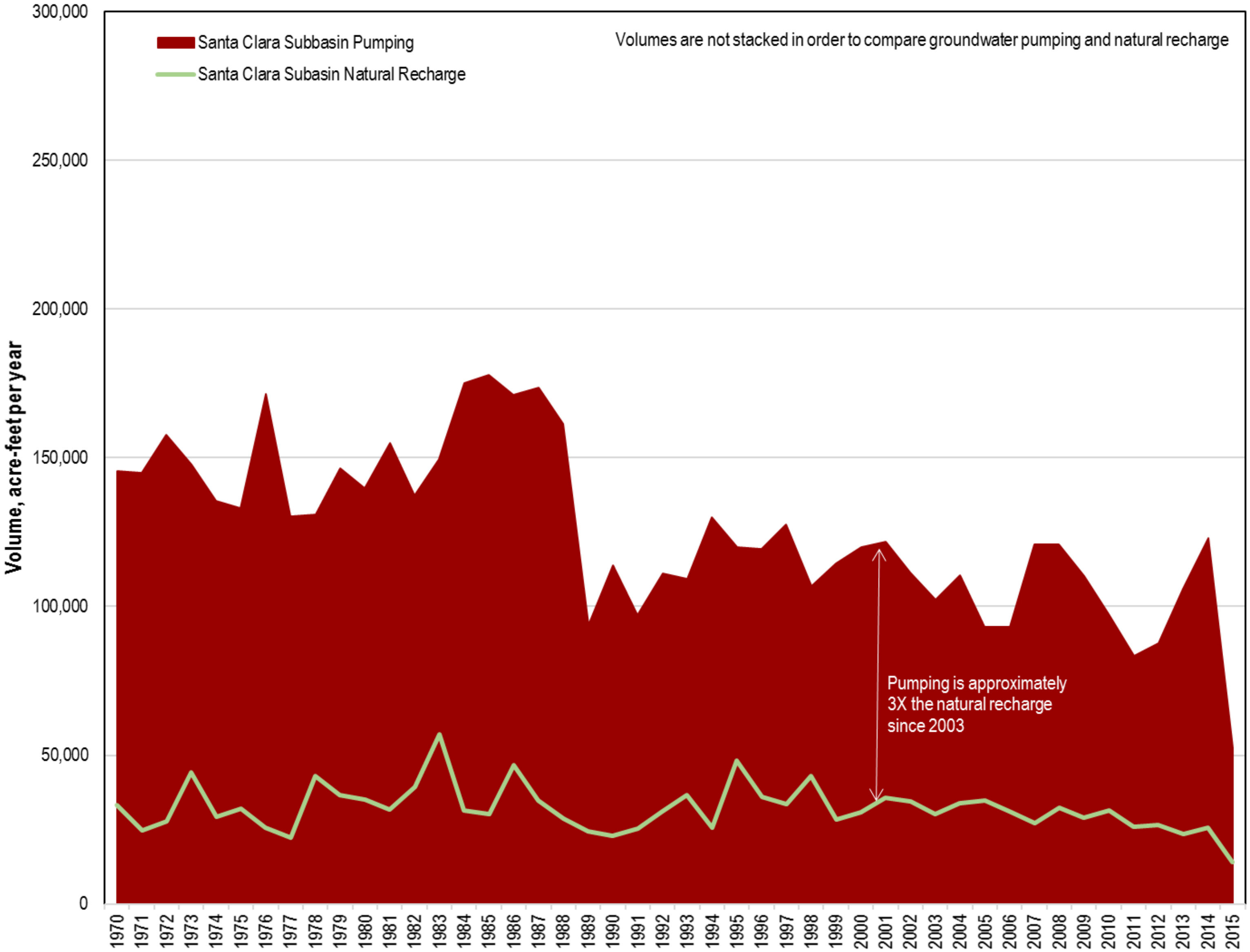


Figure 15. Santa Clara Subbasin Natural Recharge vs. Groundwater Pumping

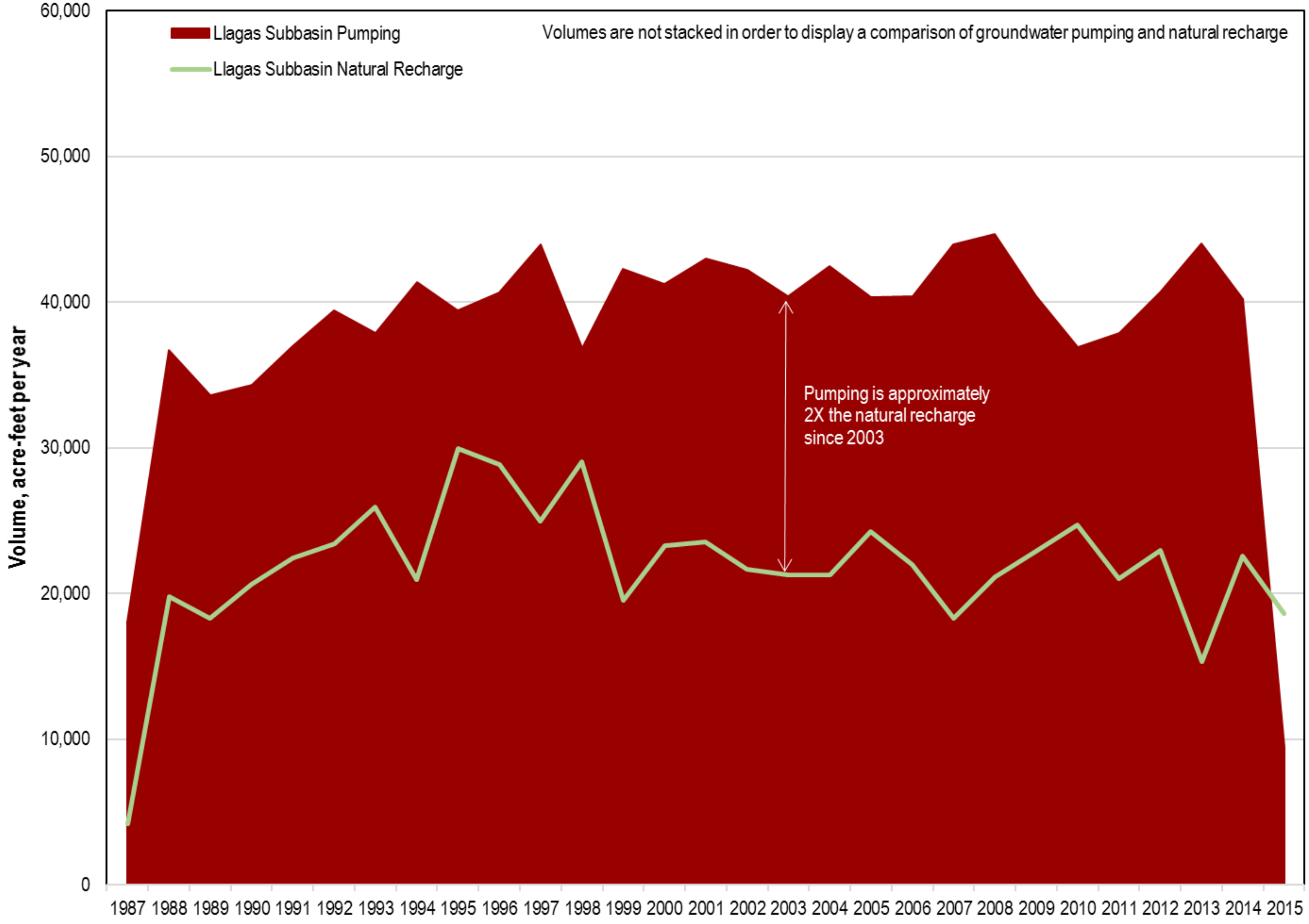


Figure 16. Llagas Subbasin Natural Recharge vs. Groundwater Pumping

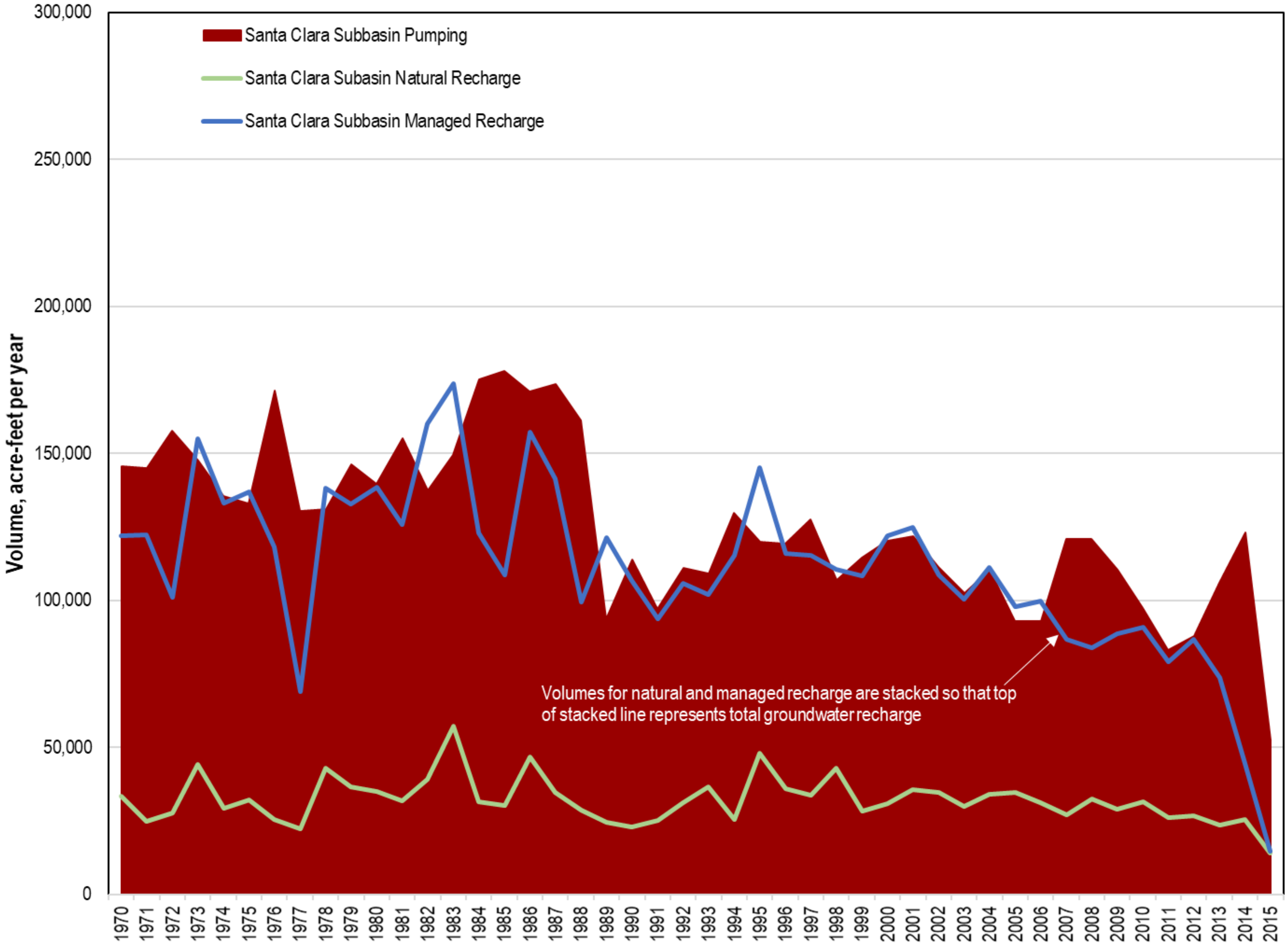


Figure 17. Santa Clara Subbasin Total Recharge vs. Groundwater Pumping

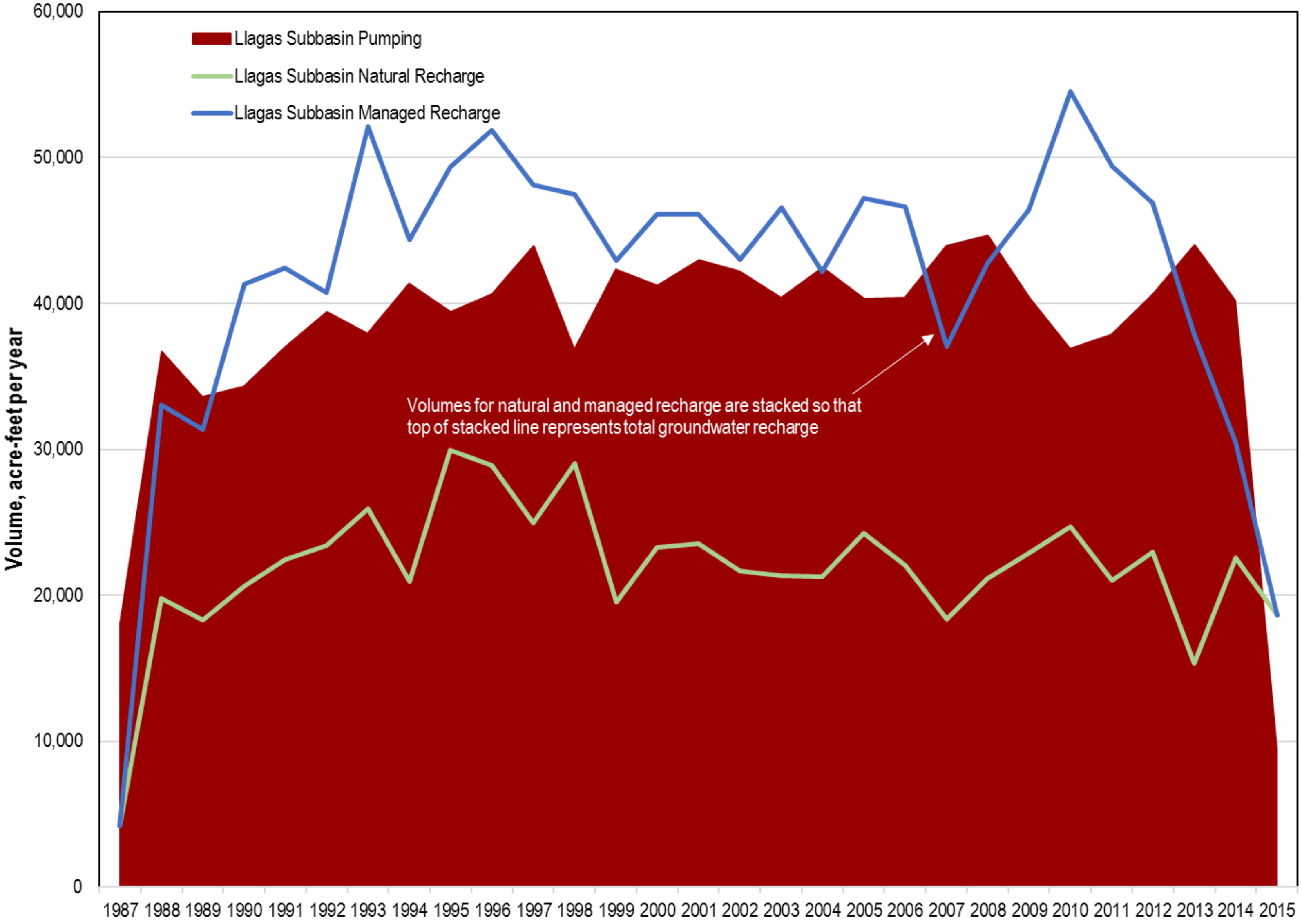


Figure 18. Llagas Subbasin Total Recharge vs. Groundwater Pumping

6.3 Benefits to Water Budget from In-Lieu Recharge Activities

The District's in-lieu recharge activities benefit the water budgets for the subbasins by reducing groundwater pumping. For Santa Clara Subbasin and Llagas Subbasin, respectively, Figure 19 and Figure 20 show these benefits by stacking in-lieu recharge on top of groundwater pumping. The stacked in-lieu recharge amounts show what pumping quantities would be without District activities and therefore how in-lieu recharge improves water budgets.

District in-lieu recharge activities in the Santa Clara Subbasin (Figure 19) primarily consist of treated water deliveries (stacked green area), but also include untreated surface water deliveries (dark blue stacked areas) and recycled water deliveries (stacked purple areas). Without District in-lieu recharge activities in the Santa Clara Subbasin, groundwater pumping would exceed total recharge even with District managed recharge. If groundwater pumping were to exceed total recharge, groundwater levels would decline, resulting in less reliable groundwater supply and increased risk of land subsidence and saltwater intrusion. Therefore, in-lieu recharge provides benefits that improve groundwater levels, which in turn improves groundwater supply reliability and helps limit land subsidence and control saltwater intrusion. Since demand in the Santa Clara Subbasin exceeds total recharge in all years, District in-lieu recharge always provides benefits by meeting some of the demand and reducing pumping.

District in-lieu recharge activities in the Llagas Subbasin (Figure 20) consist of surface water deliveries (dark blue stacked areas) and recycled water deliveries (stacked purple areas). Without treated water deliveries in the Llagas Subbasin, District in-lieu recharge activities are less than what occurs in the Santa Clara Subbasin. Most of the time in the Llagas Subbasin, total recharge exceeds groundwater demand as represented by groundwater pumping plus in-lieu recharge. However, Figure 20 shows how in-lieu recharge helps reduce groundwater pumping and allows total recharge to exceed pumping by greater amounts during wet years and reduces shortfall between pumping and total recharge in dry years.

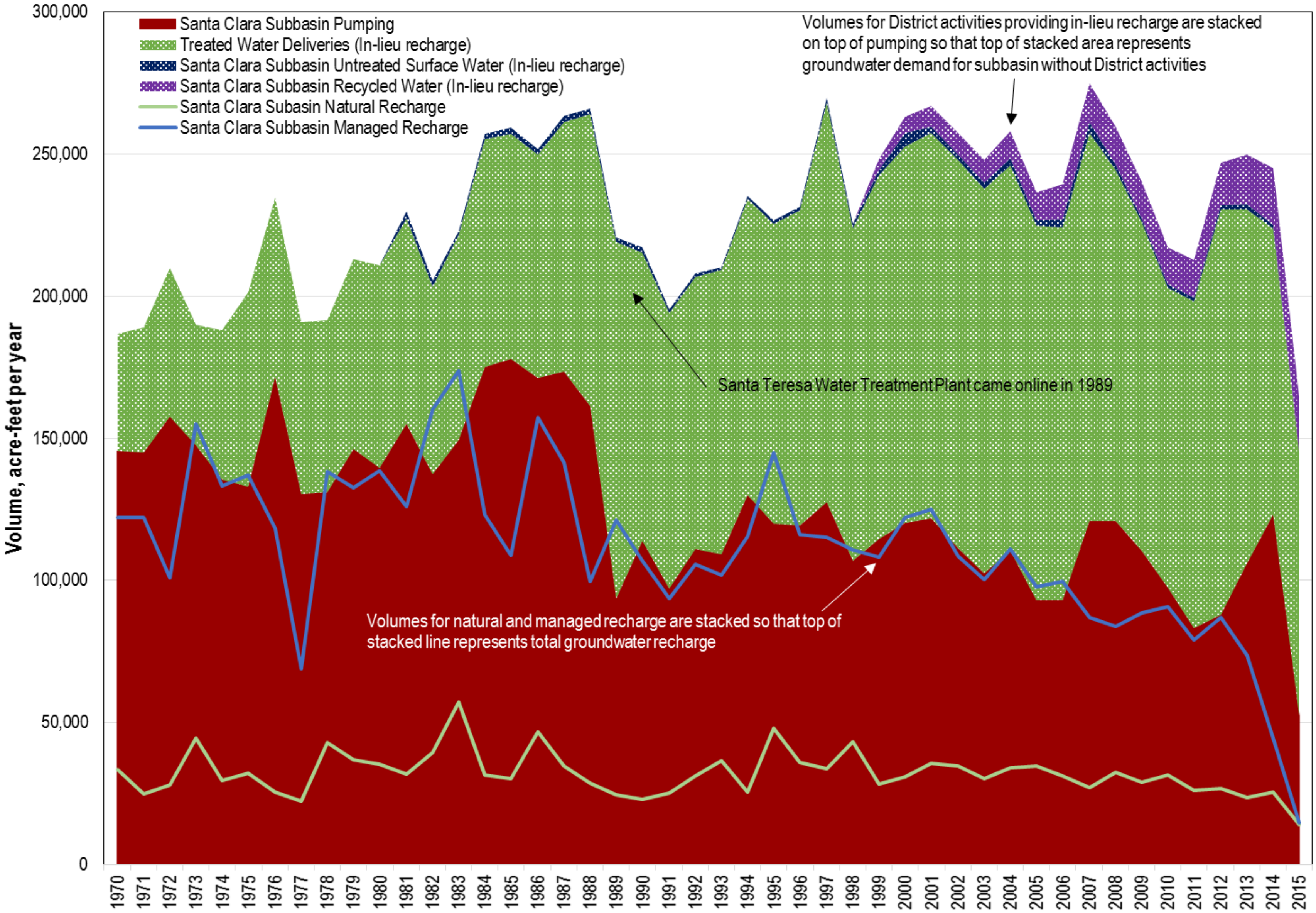
Figure 19 includes the following District in-lieu recharge activities in the Santa Clara Subbasin:

- Delivery of treated water to retailers that reduces groundwater pumping and provides in-lieu recharge
- Recycled water deliveries by the Palo Alto, Sunnyvale, and South Bay Water Recycling systems supported by the District that reduces groundwater pumping and provides in-lieu recharge or allows for reduction of surface water deliveries without increasing groundwater pumping and therefore contributes to in-lieu recharge.
- Delivery of untreated surface water to specific parcels that reduces groundwater pumping and provides in-lieu recharge

Non-District activities, primarily the delivery of SFPUC Regional Water System imported water, also provide in-lieu recharge to the Santa Clara Subbasin. Total groundwater demand if these non-District activities were not taking place would be even higher than what is plotted on Figure 19 which only shows in-lieu recharge from District activities.

Figure 20 includes the following District in-lieu recharge activities in the Llagas Subbasin:

- Recycled water deliveries by the South County Regional Wastewater Authority supported by the District that reduces groundwater pumping and provides in-lieu recharge
- Delivery of untreated surface water to specific parcels that reduces groundwater pumping and provides in-lieu recharge



Volumes for District activities providing in-lieu recharge are stacked on top of pumping so that top of stacked area represents groundwater demand for subbasin without District activities

Santa Teresa Water Treatment Plant came online in 1989

Volumes for natural and managed recharge are stacked so that top of stacked line represents total groundwater recharge

Figure 19. Santa Clara Subbasin Water Budget with District In-Lieu Recharge Activities

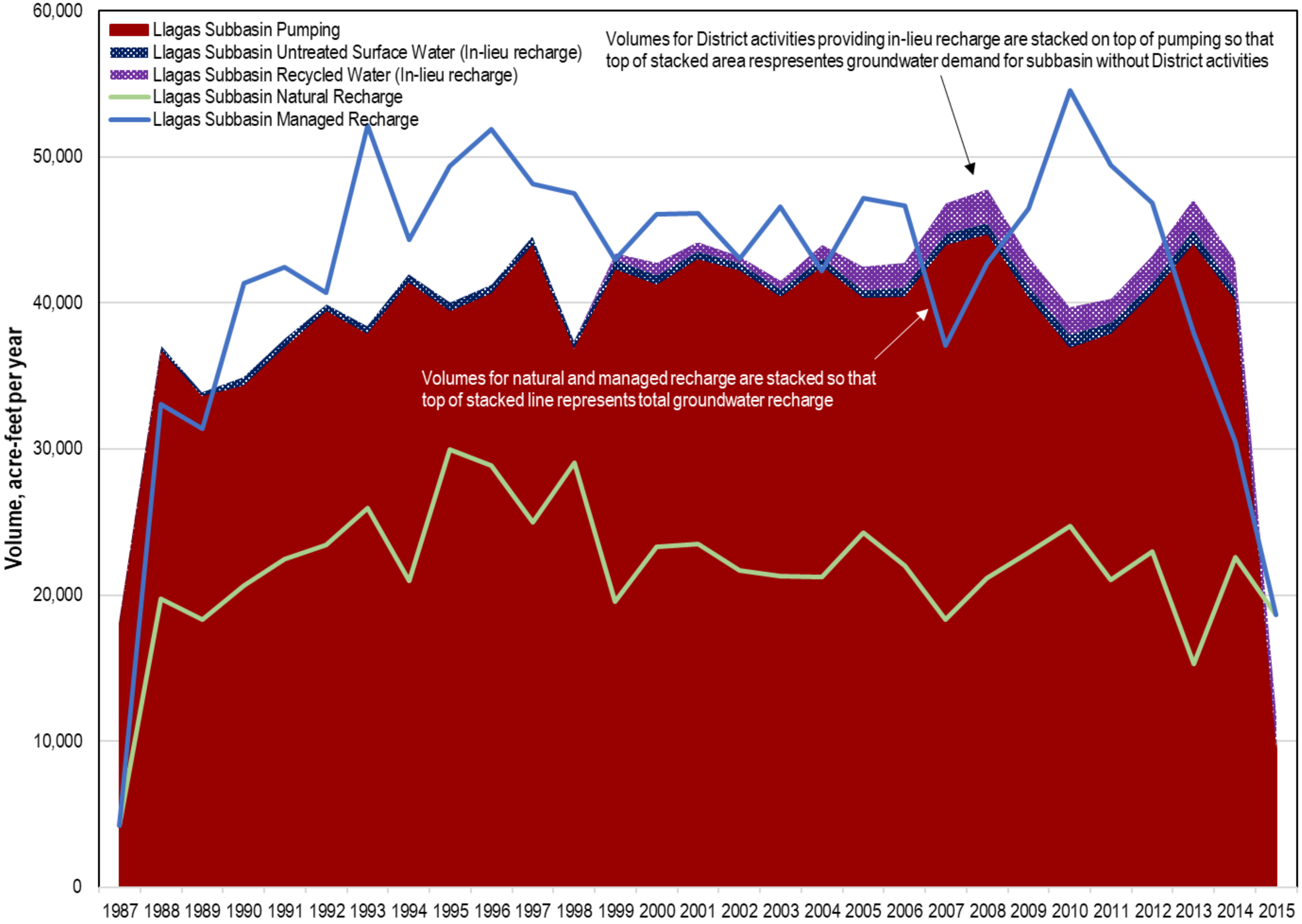


Figure 20. Llagas Subbasin Water Budget with District In-Lieu Recharge Activities

6.4 Application of Water Budget Evaluation to Analyses Supporting Groundwater Benefit Zones

The above summary provides a description of the general benefits to the water budgets of the potentially hydrogeologically connected areas of the Santa Clara Subbasin and the Llagas Subbasin. In order to support recommendation of groundwater benefit zones, groundwater level data evaluation and groundwater modeling is used to evaluate benefits in specific areas from specific District activities. In the groundwater level data evaluation, only specific time periods can be evaluated for benefits from District activities and benefits may not be evident in the evaluated periods due to factors such as decreasing precipitation and increasing pumping.
The modeling scenarios evaluate District activities based on reducing the District activity over specific historical periods based on the availability of data. The water budget evaluation shows that the water budget benefit occurs for all periods since the District activities have commenced. Therefore, if benefits are demonstrated by groundwater level data or modeling over any period, it can be reasonably assumed that the benefit occurs over all periods while District activities are taking place.

7 MAPPING AND QUANTIFYING DISTRICT ACTIVITIES

7.1 Managed Aquifer Recharge

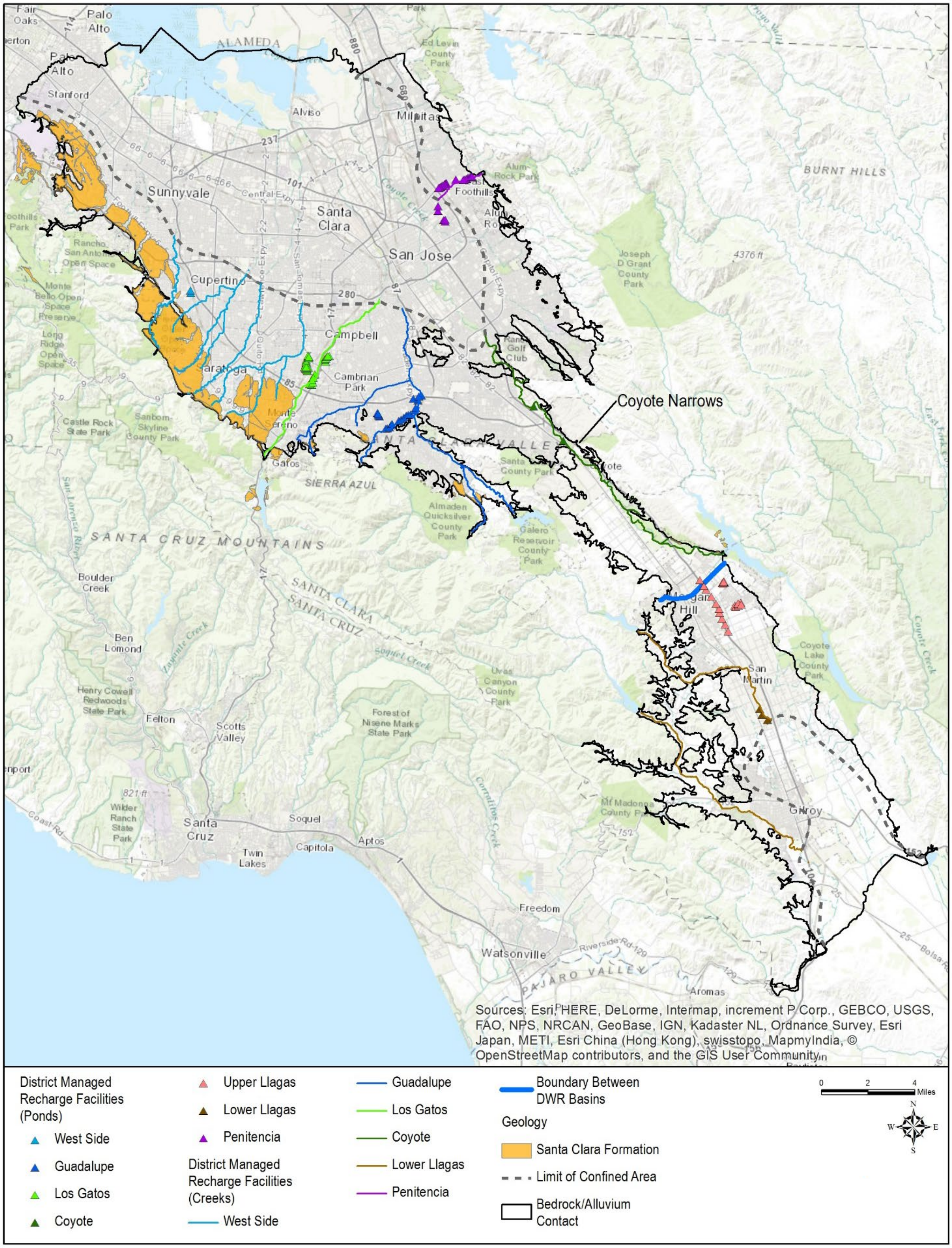
Locations of the District's managed aquifer recharge facilities are based on the files from the District's Geographic Information System (GIS) for recharge ponds and recharge streams supplemented by the National Hydrography Dataset (USGS, 2016).

For identification purposes, the recharge ponds and streams are grouped into systems consistent with District grouping: West Side, Los Gatos, Guadalupe, Coyote, Penitencia, Upper Llagas, and Lower Llagas recharge systems (SCVWD, 2016b). All systems but the Lower Llagas system are able to receive water from the State Water Project or Central Valley Project and have the ability to recharge imported water as well as local runoff. The Lower Llagas system only recharges local runoff. Figure 21 shows the map of the recharge systems overlain on the basin geology.

Figure 21 shows that the managed recharge system creeks generally flow out of the bedrock areas into the alluvium. The West Side system flows over the Santa Clara Formation before flowing into the larger Unconsolidated Alluvium area. The Coyote system flows enters Unconsolidated Alluvium in Coyote Valley and flows north through Coyote Narrows into the Santa Clara Plain. The Lower Llagas system flows through the Unconsolidated Alluvium west of the bedrock outcrops into the Unconsolidated Alluvium in the Llagas Subbasin valley floor. All recharge ponds are located in the Unconsolidated Alluvium in the valley floor.

The District provided monthly recharge quantities for 1967-2014 by recharge facility for the West Side, Los Gatos, Guadalupe, Coyote, and Penitencia systems. The District provided annual recharge quantities from July 1987-2014 by recharge facility for the Upper Llagas and Lower Llagas systems. These data were aggregated into recharge quantities by water year and by system for the groundwater level data evaluation (Section 8).

The District operated these systems before records of recharge quantity data existed. The District compiled the operation start dates of recharge ponds from various sources. The Study evaluates benefits of managed recharge creeks beginning with construction of the upstream reservoirs. Table 2 shows the operation start date for each system is based on the first start date of any facility in the system.



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Figure 21. District Managed Aquifer Recharge Systems

Table 2. Managed Recharge Start Dates

System	First Facility	Start Date	Reference
Coyote System	Coyote Percolation Ponds	1934	SCVWD, 1998
Guadalupe System	Alamitos Ponds	1932	SCVWD, 1998
Los Gatos System	Vasona Reservoir	1934	SCVWD, 2016b
Lower Llagas System	Chesbro Reservoir[1]	1955	SCVWD, 2016b
Penitencia System	Capital Ponds	1934	SCVWD, 2016b
Upper Llagas System	Main Ave. Ponds	1955	SCVWD, 1998
West Side System	Stevens Creek Reservoir	1935	SCVWD, 2016b

[1] Although Chesbro Reservoir was built for flood control, recharge benefits can be evaluated from the date of construction.

7.2 Treated Water Deliveries

The Study maps areas receiving District treated water to identify the source waters for different areas within retailer's service areas. Identification of areas receiving District treated water were based on the District's infrastructure reliability project technical memoranda on each retailer (SCVWD and AECOM, 2014a-j[1]), maps provided by the retailers, and Geographic Information System files provided by the retailers. Table 3 summarizes the references identifying these areas receiving District treated water and Figure 22 displays the treated water delivery areas overlain on the basin geology. Discussion of areas receiving other sources of water is provided in Section 8.1.2.1.

Table 3. Areas Receiving District Treated Water

Retailer	Zone/Area Identified	GIS Source
Cal Water	Cupertino, Southwest of Foothill Expressway	SCVWD and AECOM, 2014e
Mountain View	Zone 3 (area west of Hwy 85 and approximately south of Cuesta Dr.)	City of Mountain View, 2005
Milpitas	Zones SC1 (West of I-880) and SC2 (South of Calaveras Blvd and west of I-680)	City of Milpitas, 2015
Santa Clara	Zones II and IIA (approximately south of Benton St.)	City of Santa Clara, 2012
Sunnyvale	Zones II and III (approximately El Camino Real and south)	SCVWD and AECOM, 2014b
San Jose Municipal	Evergreen	San Jose Municipal system map
San Jose Water Co.	San Jose, Cupertino, Saratoga, Campbell	San Jose Water Company GIS, 2016

---

[1] These reports are confidential, but information on delivery areas is not confidential.

Figure 22 shows that treated water delivery areas are located primarily in Unconsolidated Alluvium in the Santa Clara Plain north of Coyote Narrows, but also overlap the Santa Clara Formation and bedrock. Groundwater users in all of these areas receiving District treated water benefit from the in-lieu recharge occurring in these areas. The Los Altos area of Cal Water receiving District treated water overlies the Santa Clara Formation with the Foothill Expressway boundary of this area approximately coincident with the eastern extent of the Santa Clara Formation. The Cupertino and West areas of San Jose Water Company also partially overlie the Santa Clara Formation. Even in bedrock, groundwater users benefit from neighbors receiving treated water as this in-lieu recharge reduces demand for limited supplies in bedrock fractures.

The District provided monthly quantities of treated water deliveries to each retailer for 1967-2015. These data were aggregated into delivery quantities by water year and by retailer for the groundwater level data evaluation (Section 8). The sum of individual retailer quantities for Water Years 1970-1973 were over 25% short of quantities for total treated water deliveries so retailer quantities for these years were proportionally increased to match the totals.

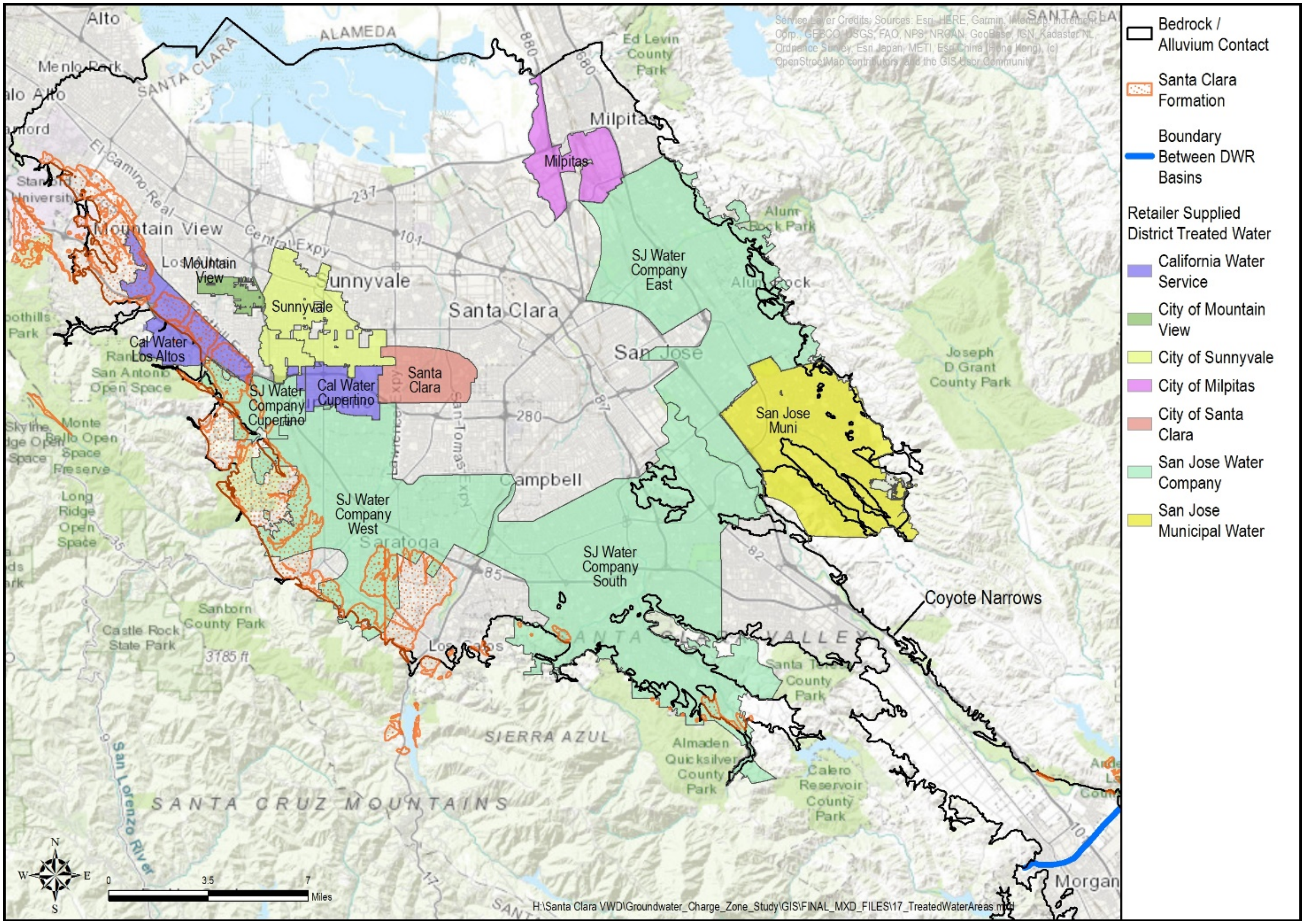


Figure 22. Retailer Areas Receiving District Treated Water Deliveries

7.3 Recycled Water

Mapping of recycled water deliveries is based on GIS files provided by the District of pipeline alignments for the four recycled water systems: Palo Alto, Sunnyvale, South Bay Water Recycling Program and South County Regional Wastewater Authority. Figure 23 shows the pipelines overlying geology.

The Palo Alto and Sunnyvale systems overlie Unconsolidated Alluvium in the Santa Clara Plain. The South Bay Water Recycling Program system mostly overlies Unconsolidated Alluvium in the Santa Clara Plain, but also overlies some bedrock areas to the southeast and extends a short distance across Coyote Narrows into Coyote Valley. The South County Regional Wastewater Authority system overlies Unconsolidated Alluvium deposits in the Llagas Subbasin in Gilroy and east of Gilroy.

The District provided monthly quantities of recycled water deliveries from 1998-2015 for each of the four systems, including deliveries from the District’s Silicon Valley Advanced Water Purification Center via the South Bay Water Recycling Program system. Figure 19 and Figure 20 are based on these data aggregated into delivery quantities by water year and by system. However, as shown by Figure 19 and Figure 20, these deliveries are a relatively small part of the overall budget and therefore the effect is not expected to be observed in the groundwater level evaluation. Existing pipelines (Figure 23) will need to be extended to deliver purified water for planned indirect potable reuse projects. The District is still in process of evaluating those plans.

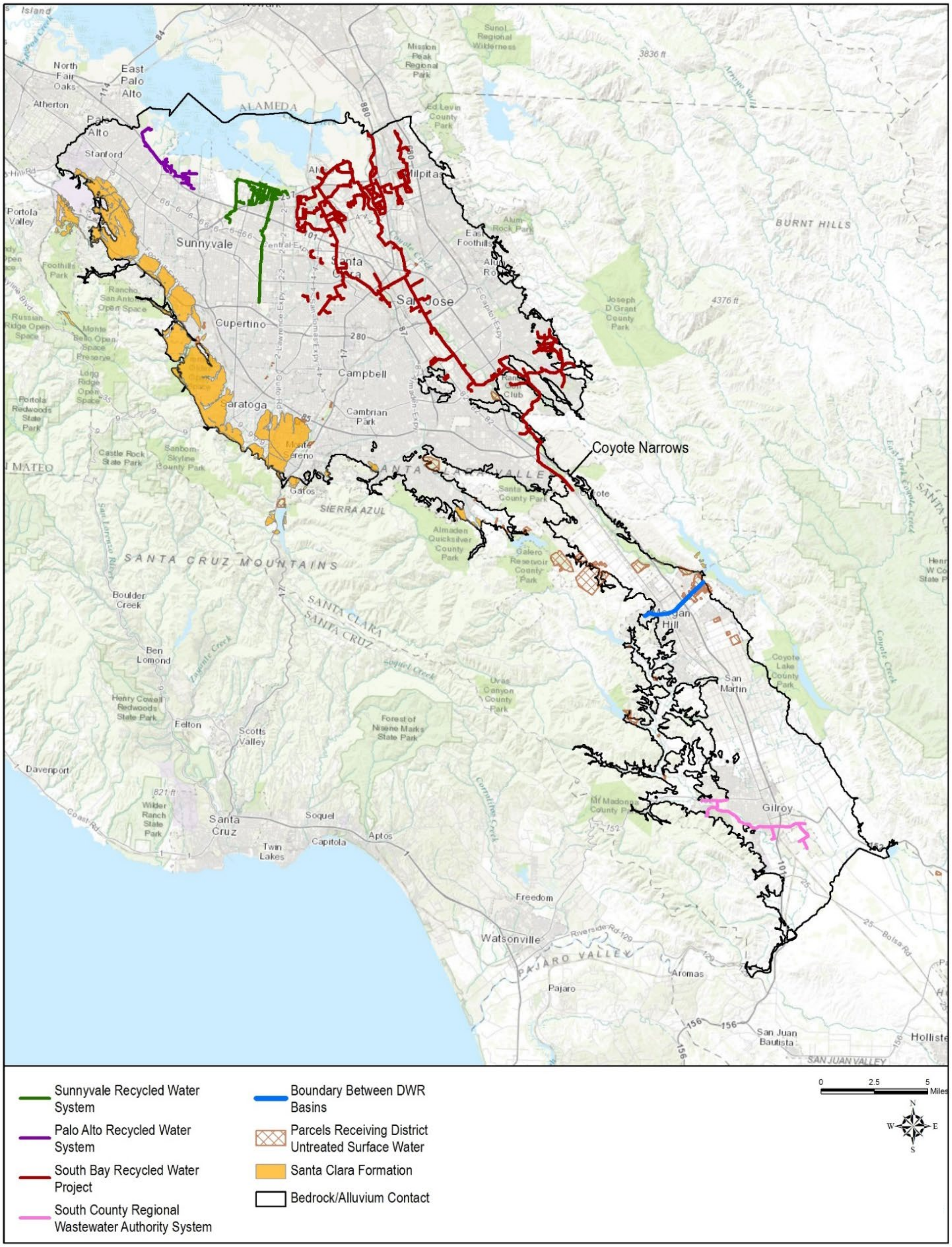


Figure 23. Recycled Water Systems and Parcels Receiving District Untreated Surface Water

7.4 Surface Water Deliveries

Mapping of the District's untreated surface water deliveries is based on District's data of parcels receiving deliveries and County GIS files of parcels. Figure 23 shows locations of parcels that have received surface water deliveries from fiscal years 2010-2015, overlain on the basin geology.

Parcels receiving untreated surface water deliveries overlie Unconsolidated Alluvium in the Santa Clara Plain, Coyote Valley, and Llagas Subbasin both west and east of bedrock outcrops in that subbasin. There are also parcels receiving untreated surface water deliveries in bedrock.

The District provided semi-annual quantities of surface water deliveries. Data are available by existing groundwater benefit zone prior to fiscal year 2010 and by parcel since fiscal year 2010. Data for zone W-2 commence in 1981 while data for zone W-5 commence in 1987. Figure 19 and Figure 20 are based on these data aggregated into annual delivery quantities by existing groundwater benefit zone. However, Figure 19 and Figure 20 show that these deliveries are a relatively small part of the overall budget and therefore the effect is not expected to be observed in the groundwater level evaluation. Also, surface water delivery areas are parcel based so groundwater users on a parcel are assumed to be the same as the surface water customer for the parcel. Therefore, there are no other groundwater users in the surface water delivery areas that receive in-lieu benefits from surface water delivery areas.

7.5 Conservation Activities

Conservation provides in-lieu recharge benefits to groundwater users by reducing the amount of groundwater pumped. Conservation activities occur throughout the District so groundwater users throughout the District receive in-lieu benefits. Figure 24 shows a map of parcels receiving different conservation rebates to demonstrate the widespread nature of the conservation activities. However, the disperse nature of conservation and its variable application is expected to make it difficult to be observed in the groundwater level evaluation. In addition, the rebates are equally available throughout the District, so benefits are available throughout the District. Therefore, conservation activities are not used to define groundwater benefit zones.

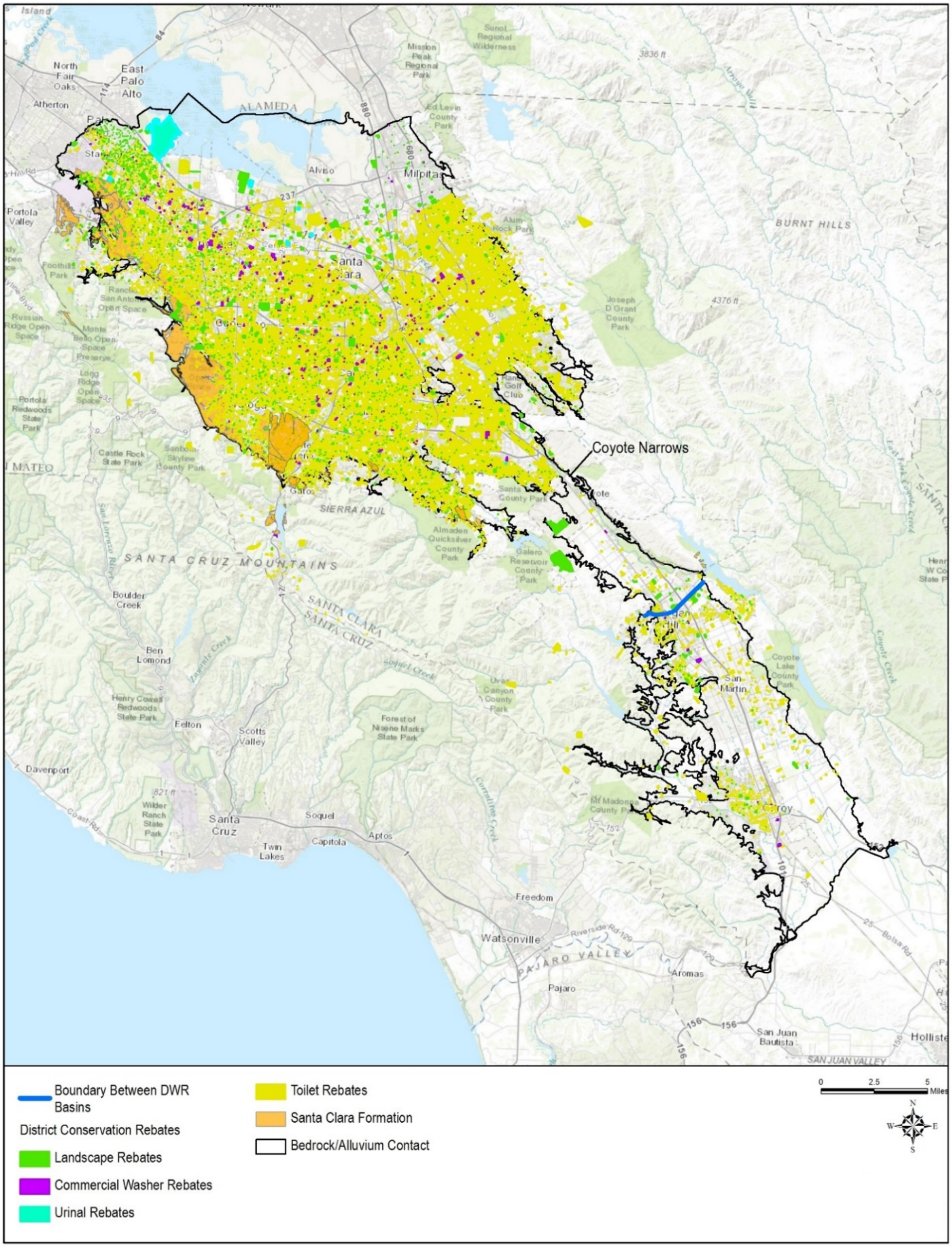


Figure 24. Parcels Receiving Conservation Rebates

8 GROUNDWATER LEVEL DATA EVALUATION

As described in the methodology memo, the Study uses groundwater level data to evaluate areas where groundwater users benefit from District deliveries of treated water and areas where groundwater users benefit from District managed aquifer recharge activities. This evaluation follows two basic steps:

1. Identify periods for evaluating benefits from District recharge activities based on groundwater level trends (evaluation periods). Evaluation periods are chosen based on two criteria:
    a. Climatic conditions and area pumping during these periods would result in an expected decreasing groundwater level trend if no District activity occurred.
    b. These periods show active and stable or increasing District in-lieu or managed recharge during the periods such that a stable or increasing groundwater trend during the period can be attributed to the District activity.
2. During these evaluation periods, evaluate whether observed groundwater level data in the area show a stable or increasing trend demonstrating a benefit from the District activity. If the benefit from District activities is demonstrated in one evaluation period, it is considered to occur as long as the District activity is taking place:
    a. Section 6 shows District activities have been providing benefit to the water budget for all periods, whether or not they meet evaluation criteria.
    b. Evaluation periods are periods of expected declining groundwater. If during these periods groundwater levels are stable or increasing, the benefit of the District activity is demonstrated. The benefit from the District activity is not demonstrated if declining groundwater levels are observed, but this also does not indicate lack of benefit from District activities as the District activity may still be benefitting by limiting the decline in groundwater levels.

8.1 Identify Periods for Evaluation

The three factors used to identify evaluation periods are rainfall, area pumping, and quantities of treated water delivery and managed aquifer recharge provided by the District activities. Without a District activity, we expect groundwater level trends to decrease if rainfall is decreasing and/or pumping is increasing. The expectation is groundwater level trends would also decrease if rainfall is decreasing or pumping is increasing while the other factor is stable. In order to attribute an increasing groundwater level trend to either the District's treated water or managed recharge activity during evaluation periods, the quantities provided by the District activity needs to be stable or increasing. Decreasing groundwater level trends are likely to be observed in many evaluation periods even with benefits from District activities occurring due to the rainfall and area pumping conditions.

8.1.1 Rainfall

Rainfall at the City of San Jose gauge station ID 6131 of the ALERT hydrologic data collection system (ALERT ID 1453) is representative of changes to climatic conditions within the District's Subbasins. Annual water year rainfall totals from 1932-2013 are used to calculate the cumulative departure from the mean annual rainfall (

Figure 25). Periods when the cumulative departure is stable or declining meet the criteria for evaluation periods.

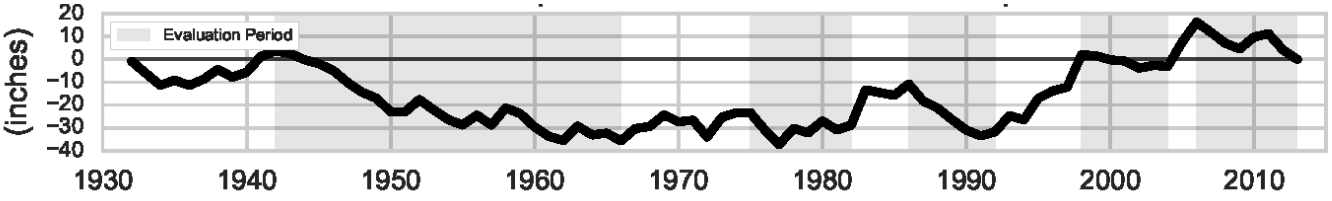


Figure 25. Cumulative Departure of Mean Annual Rainfall

8.1.2 Area Pumping

In order to identify evaluation periods, the Study totals pumping for each retailer and non-retailer area distinguished by water source. In other words, a retailer's service area is divided into multiple pumping areas if the retailer delivers different water sources to different areas. These pumping areas are used because the availability of surface water such as District treated water, RWS or San Jose Water Company's surface water derived from its own water right affects pumping demand for the area. Appendices C-F and example figures, Figure 29 through Figure 38, include the aggregated groundwater pumping by pumping area over time.

This approach ensures that the groundwater level data evaluation accounts for the effects of in-lieu recharge by non-District deliveries. Therefore, a benefit from any non-District in-lieu recharge such as SFPUC RWS deliveries or San Jose Water Company's surface water will not be misattributed to a District activity.

In addition, the evaluation of benefits from the District managed recharge activity also accounts for the effects of in-lieu recharge by District deliveries of treated water. Even with in-lieu recharge sources for an area, if pumping is increasing while rainfall is stable or decreasing, the expected groundwater level trend is still decreasing. The in-lieu recharge may have reduced the expected decrease in groundwater level trend but a stable or increasing groundwater level trend concurrent with stable or increasing quantities from a District activity would demonstrate a benefit from that District activity. Likewise, in-lieu recharge may result in stable pumping, including zero or near-zero pumping, in an area, but expected groundwater level trend is decreasing if rainfall is decreasing. Thus, the Study seeks to compare anticipated outcomes with no District activity with actual outcomes and recognizes benefits from District activities if the actual outcome reflects an improvement over anticipated outcomes.

8.1.2.1 Mapping Retailer and Non-Retailer Areas by Water Source

Retailer areas receiving District treated water are mapped as described in Section 7.2. Groundwater users in all of these areas receiving District treated water benefit from in-lieu recharge so the groundwater level trend evaluation only assessed benefits from managed recharge in these areas. The groundwater level trends were used to evaluate benefits from both managed recharged and treated water deliveries in areas not receiving District treated water.

In addition to mapping retailer areas receiving treated water as discussed in Section 7.2, the Study maps retailer areas receiving water from San Francisco Public Utilities Commission’s RWS supplies and San Jose Water Company’s surface water. The Study also maps areas supplied only by groundwater.

As with mapping areas receiving treated water, the references used to identify areas receiving different sources were the District’s infrastructure reliability project technical memoranda on each retailer, maps provided by the retailers, and Geographic Information System files provided by the retailers. Table 4 summarizes the mapped areas.

These areas also are used to summarize pumping because the availability of different sources of water for each area presumably affects groundwater demand in that area. To facilitate these areal pumping summaries, the large area of San Jose Water Company serving primarily District treated water was divided into three areas based on District managed recharge creeks. The west area is the area west of Los Gatos Creek. The south area is the area between Los Gatos and Coyote Creek. The east area is the area east of Coyote Creek.

In addition, non-retailer areas are identified to facilitate areal pumping summaries. North Morgan Hill is the non-retailer area between Morgan Hill and San Jose. Eastern Llagas is the non-retailer area east of Morgan Hill, Gilroy, and the bedrock outcrops in the Llagas Subbasin identified on Figure 13. Uvas-Chesbro is the non-retailer area downstream of the District’s Uvas and Chesbro Reservoirs west of Morgan Hill, Gilroy, and the bedrock outcrops in Llagas Subbasin identified on Figure 13. Figure 26, Figure 27, and Figure 28 show the pumping areas in Santa Clara Plain, Coyote Valley, and Llagas Subbasin, respectively.

Table 4. Summary of Pumping Areas and Non-District Treated Water Supplies

Retailer	Water Supply Source	Zone/Area Identified	GIS Source
Cal Water	Groundwater	Sunnyvale, Mountain View	City of Mountain View, 2008
Gilroy	Groundwater	All	SCVWD GIS for Retailer Sources
Great Oaks	Groundwater	All	Great Oaks PUC Grid
Milpitas	SFPUC	Zones SF1-4(northeast of I-880 and Calaveras Rd., east of I-680, between I-880, S. Main St, and approximately Great Mall Pkwy)	City of Milpitas, 2015
Mountain View	Groundwater and SFPUC	Zone 1 and 2 (approximately north of Cuesta Dr. and east of Hwy 85)	City of Mountain View, 2005 and 2008
Morgan Hill	Groundwater	All	SCVWD GIS
NASA Ames	SFPUC	All	SCVWD GIS
Palo Alto	SFPUC	All	SCVWD GIS
Santa Clara	Groundwater	Zone I and Zone II and IIA (approximately south of Central Expressway)[1]	City of Santa Clara, 2012
	Groundwater and SFPUC	Zone I and IA (approximately north of US 101)	
Sunnyvale	Groundwater	All (blended)	SCVWD and AECOM, 2014b
	SFPUC	Zone I (approximately north of El Camino Real)	
San Jose Municipal	Groundwater	Edenvale and Coyote	San Jose Municipal system map
	SFPUC	Alviso	
San Jose Water Co.	Groundwater	San Jose (north) Cupertino (with SCVWD Treated Water)	San Jose Water Company GIS, 2016
	Local Surface Water Right	Saratoga, Los Gatos	
Stanford	SFPUC	All	SCVWD GIS

[1] Parts of City of Santa Clara Zones II and IIA also receive SCVWD treated water deliveries that is blended with groundwater.

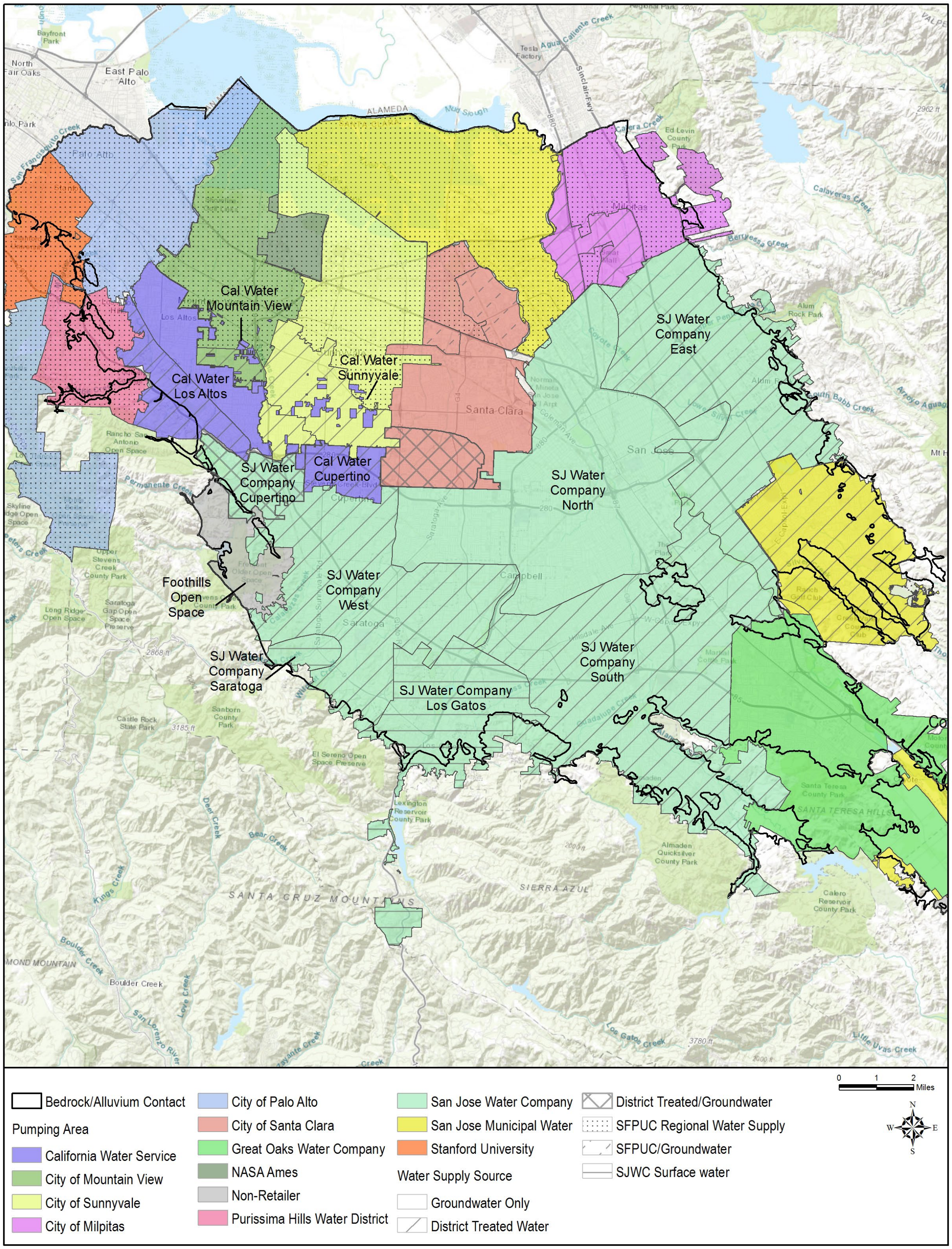
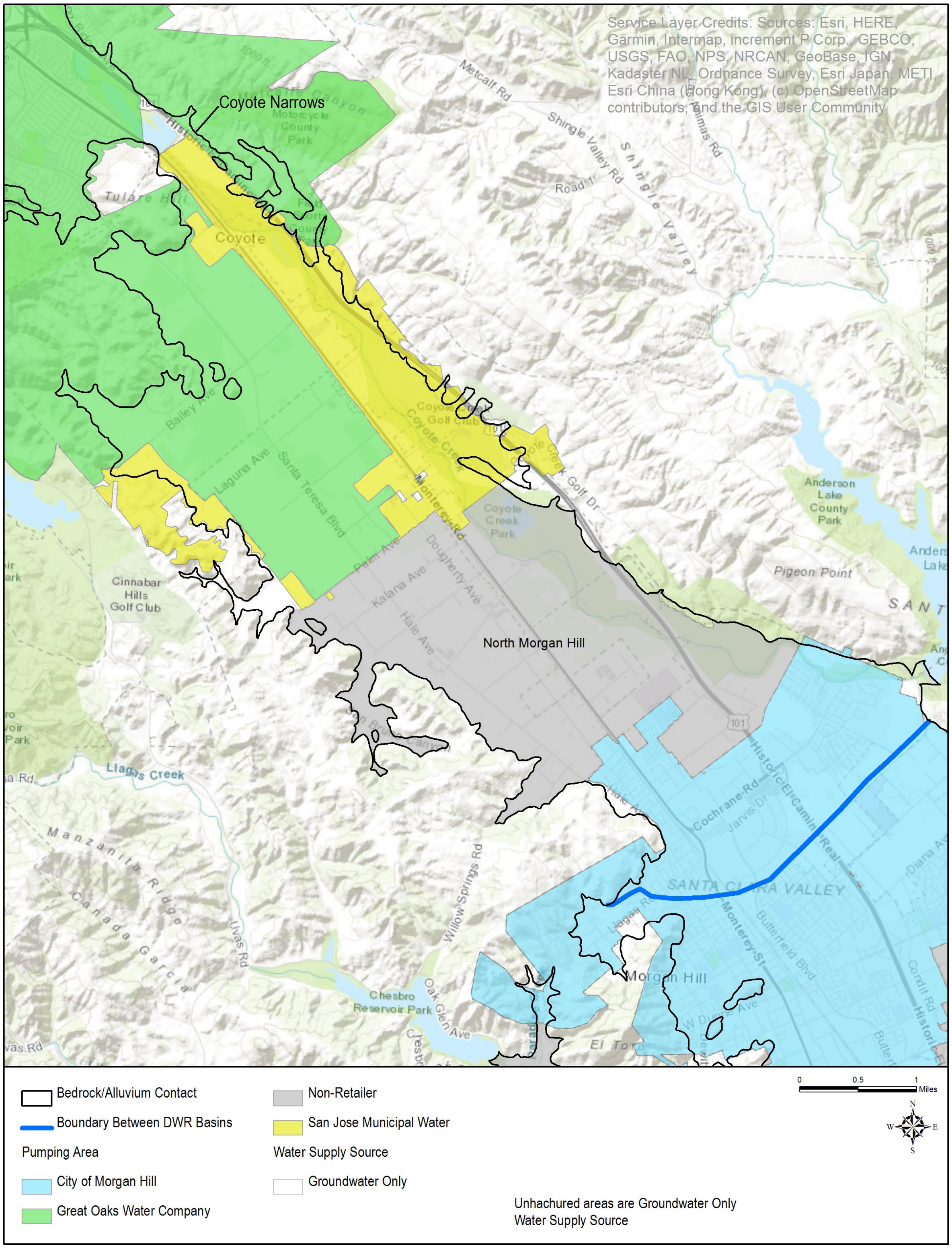


Figure 26. Pumping Areas in Santa Clara Plain



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 27. Pumping Areas in Coyote Valley

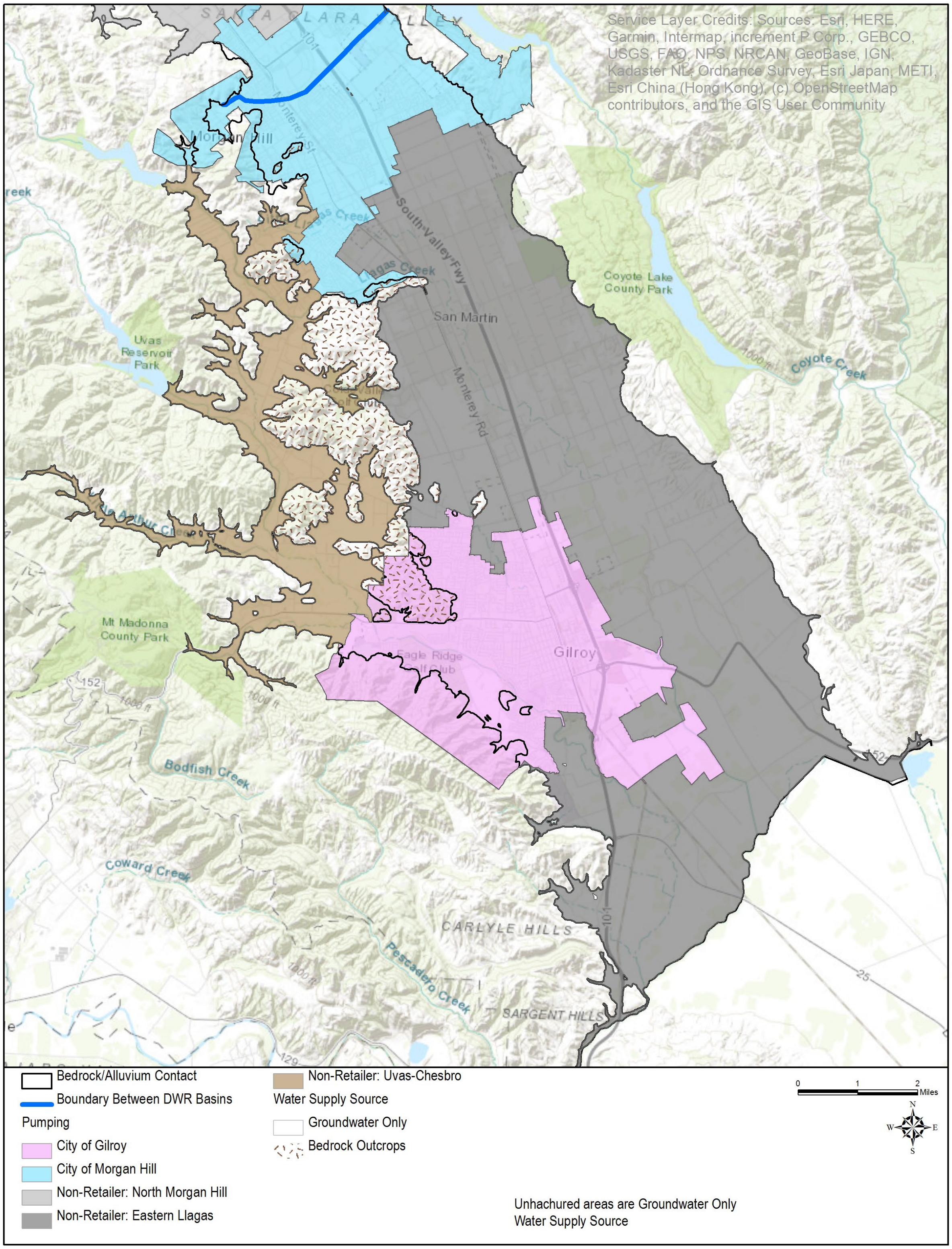

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
SANTA CLARA VALLEY
101
Morgan Hill
Monterey St
Llagas Creek
South Valley Fwy
San Martin
Coyote Lake County Park
Coyote Creek
Uvas Reservoir Park
Monterey Rd
Gilroy
Eagle Ridge Golf Club
Mt Madonna County Park
152
Bodfish Creek
Coward Creek
CARLYLE HILLS
Pescadero Creek
SARGENT HILLS
25
129
Bedrock/Alluvium Contact
Boundary Between DWR Basins
Pumping
City of Gilroy
City of Morgan Hill
Non-Retailer: North Morgan Hill
Non-Retailer: Eastern Llagas
Non-Retailer: Uvas-Chesbro
Water Supply Source
Groundwater Only
Bedrock Outcrops
0
1
2
Miles
N
W
E
S
Unhachured areas are Groundwater Only Water Supply Source

Figure 28. Pumping Areas in Llagas Subbasin

8.1.2.2 Distribution of Groundwater Deliveries

One consideration with retailer areas is whether retailers deliver groundwater supplies across potential boundaries for hydrogeologically connected areas such as the Coyote Narrows, DWR basin boundary between the Santa Clara and Llagas Subbasins, between the Santa Clara Formation and Unconsolidated Alluvium areas of the Santa Clara Plain, and through constrictions of bedrock outcrops in the Llagas. This could result in groundwater benefits from District activities in one hydrogeologically connected area extending to a different hydrogeologically connected area. Retailer delivery of groundwater supplies from a hydrogeologically connected area into bedrock is not considered to extend groundwater benefits into bedrock because the delivery of groundwater across the well-defined boundary of hydrogeologic connection is not considered a District activity.

Groundwater pumped in Unconsolidated Alluvium of the Santa Clara Plain is delivered to the Cupertino area of San Jose Water Company overlying the Santa Clara Formation. However, the boundary between hydrogeologically connected areas is well defined by the outcrop of the Santa Clara Formation and the delivery of groundwater across that boundary is not considered a District activity. Therefore, this does not result in groundwater benefits from District activities in the Unconsolidated Alluvium of the Santa Clara Plain extending into the Santa Clara Formation.

The San Jose Municipal Water System only pumps and delivers groundwater for the Edenvale area north of Coyote Narrows in Santa Clara Plain and for its Coyote area south of Coyote Narrows in Coyote Valley. Therefore, San Jose Municipal Water System does not pump groundwater and deliver it across Coyote Narrows into the other management area.

Great Oaks Water Company pumps and delivers groundwater on both sides of the Coyote Narrows in the Santa Clara Plain and Coyote Valley. Great Oaks pumps groundwater in Coyote Valley for delivery to the Santa Clara Plain, but the reverse does not occur. District managed aquifer recharge activity occurs in both Coyote Valley and Santa Clara Plain, so this delivery does not alter the area benefiting from managed aquifer recharge.

Morgan Hill straddles the DWR basin boundary representing the groundwater divide between Coyote Valley and Llagas Subbasin. If Morgan Hill’s pumping distribution changed enough to substantially move the location of the average groundwater divide, the areas considered hydrogeologically connected would be subject to revision.

Morgan Hill and Gilroy are primarily overlying the Unconsolidated Alluvium east of the bedrock outcrops (valley floor) in the Llagas Subbasin, but the western service area boundaries approach or extend into the Unconsolidated Alluvium west of the bedrock outcrop. The boundary between separate hydrogeologic areas defined by bedrock outcrops are not well defined in these areas and delivery of groundwater in the Morgan Hill and Gilroy areas help define the areas with demonstrated benefits.

8.1.2.3 Pumping Quantities

The District provided annual pumping data by well for calendar years 1981-2015 in existing Zone W-2 and 1987-2015 in existing Zone W-5. The Study identifies the pumping area for each well location and the pumping subplots in Appendices C- F and example figures, Figure 29 through Figure 38, show total annual pumping aggregated for each area.

Pumping data by well are not available prior to 1981, but recorded pumping is included in the Santa Clara Plain groundwater model for 1970-1980. The pumping subplots in Appendices C and D show modeled pumping aggregated for each of the pumping areas in the Santa Clara Plain.

Some of the pumping subplots in Appendices C-F and example figures, Figure 29 through Figure 38, also plot population for the city of the area or Census Designated Population (CDP) to evaluate likely changes in pumping demand before pumping data or estimates are available. Population increases indicate likely increase in pumping demand. However, when non-District sources of supply such as SFPUC Regional Water System or San Jose Water Company surface water become available to an area, population no longer represents a proxy for pumping demand. Therefore, the pumping subplots display milestone dates for the availability of these supplies (Walker and Williamson, 1983).

8.1.3 District Activity

The District activity subplots in Appendices C through F and example figures, Figure 29 through Figure 38, show quantities of managed recharge and treated water deliveries in the potentially hydrogeologically connected areas of the Santa Clara and Llagas Subbasins. The closest system activity to the pumping area being evaluated is plotted at the bottom with the quantities of other systems stacked based on distance. The plots for managed recharge show the start date of managed recharge systems as shown in Table 2. Prior to recharge quantity data being available, the operation of managed recharge is assumed to result in stable or increasing quantities. Evaluation periods that meet conditions for rainfall, pumping, and the District activity are identified with grey shading.

For the Santa Clara Subbasin including the Santa Clara Plain and Coyote Valley, the Study evaluates treated water deliveries (Appendix C) and managed recharge (Appendix D) separately. The Study does not evaluate managed recharge of imported water separately from managed recharge of local runoff because all managed recharge systems in Santa Clara Subbasin are connected to imported water supplies. Therefore, groundwater users that benefit from managed recharge systems in the Santa Clara Subbasin benefit from imported water supplies as well as capture of local runoff.

For the Llagas Subbasin, the Study evaluates managed recharge (Appendix E). The subplots on Appendix E plot managed recharge from the Upper Llagas and Lower Llagas systems separately based on distance from each pumping area, but the Study evaluates the systems together. The Upper Llagas system recharges both local runoff and imported water so it is not possible to evaluate the effects of recharging the two sources separately. Unlike the Upper Llagas system, the Lower Llagas system recharges only local runoff, periods when recharge in only one of the two systems is increasing were too short to evaluate the benefit from only that system. Therefore, the groundwater level evaluation is unable to distinguish between benefits from local runoff and benefits from imported water for groundwater users that benefit from managed recharge systems in the Llagas Subbasin.

Periods that have stable or increasing District managed recharge or treated water in the potentially hydrogeologically connected areas that line up with necessary rainfall and pumping conditions to evaluate are identified by the shading on the plots.

In the Santa Clara Subbasin, several periods were evaluated for both treated water and managed recharge because quantities for both activities were stable or increasing during a period with necessary rainfall and pumping conditions. Groundwater level improvements in areas during these overlapping periods demonstrate benefits from the District activities for those activities. However, groundwater level improvements can only be attributed to a specific activity if one activity increased during the overlapping period while the other activity was stable and groundwater level trends increased. As a result, the benefit demonstrated by increasing groundwater level trend can be attributed to the increasing activity. Otherwise, benefits cannot be attributed to a specific activity.

8.2 Area Groundwater Level Trends During Evaluation Periods

In Appendices C through F, plots of groundwater level data by area stacked with the plots of rainfall, pumping by area, District activity quantities are shown with the shaded evaluation periods identified. If the plotted groundwater level trends during the shaded periods are stable or increasing, a benefit from a District activity during that period is demonstrated.

8.2.1 Monitoring Well Groundwater Level Trends by Area

For each pumping area, Appendices C through E present plots of static groundwater levels from monitoring wells over time. The monitoring wells are identified as wells that do not have groundwater pumping data so may include wells constructed as water supply wells. To evaluate whether treated water deliveries or managed recharge demonstrates benefits in the area, the

Study evaluates groundwater level trends in the pumping area for each evaluation period. The Study evaluates trends based on groundwater levels from all the monitoring wells in the area because benefits to the area, not any specific well, is the criteria for establishing groundwater benefit zones. Example figures from Appendices C through E are shown on Figure 29 for managed recharge in the Santa Clara Subbasin, Figure 30 for treated water in the Santa Clara Subbasin, and Figure 31 for managed recharge in the Llagas Subbasin. The shaded periods are the evaluation periods when groundwater level trends in the bottom plot are evaluated. If the plotted groundwater level trends during the shaded periods are stable or increasing, a benefit from a District activity during that period is demonstrated. The benefit is then assumed to occur as long as the District activity is taking place and has not changed significantly.

Table 5 summarizes the evaluation of managed recharge in the Santa Clara Subbasin corresponding to plots in Appendix C. Table 6 summarizes the evaluation of treated water deliveries corresponding to plots in Appendix D.

Table 7 summarizes the evaluation of managed recharge in the Llagas Subbasin corresponding to plots in Appendix E. Most of the pumping areas evaluated have data that demonstrate benefits from each evaluated activity.

Pumping Area: SJ Water Company East: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

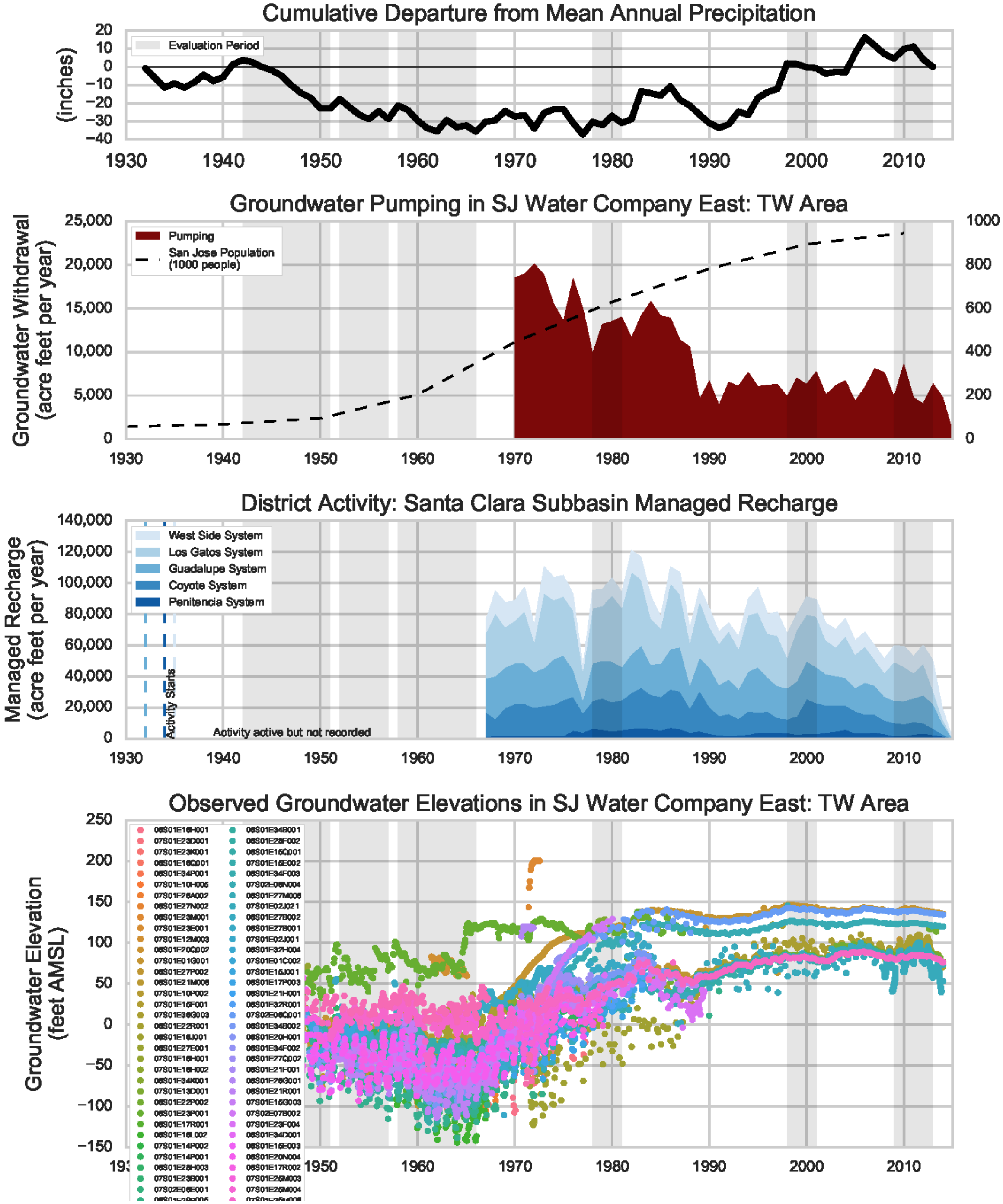


Figure 29. Example of Monitoring Well Groundwater Level Trend Evaluation of Managed Recharge in the Santa Clara Subbasin

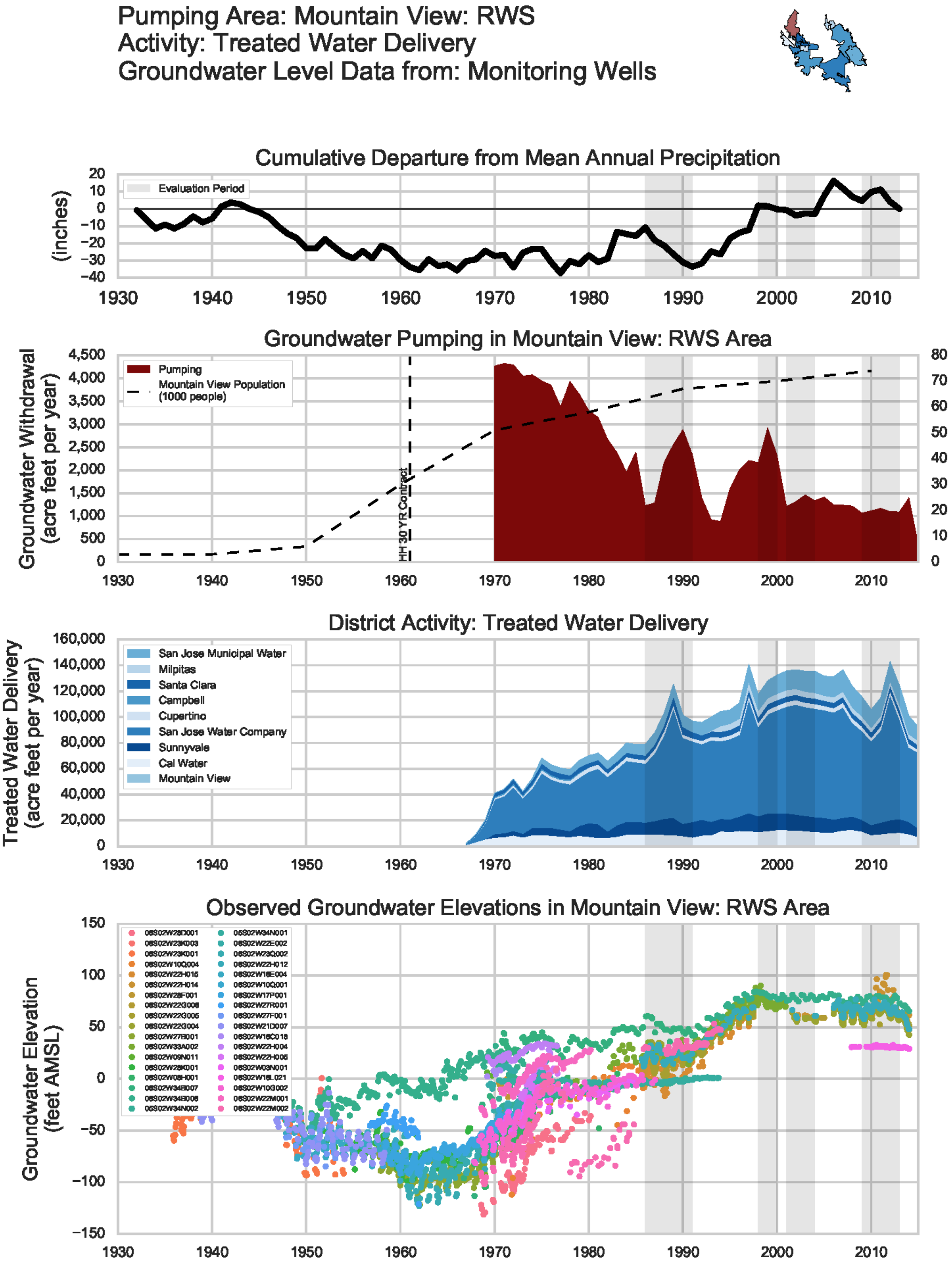


Figure 30.Example of Monitoring Well Groundwater Level Trend Evaluation of Treated Water in the Santa Clara Subbasin

Pumping Area: Morgan Hill: GW
Activity: Llagas Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

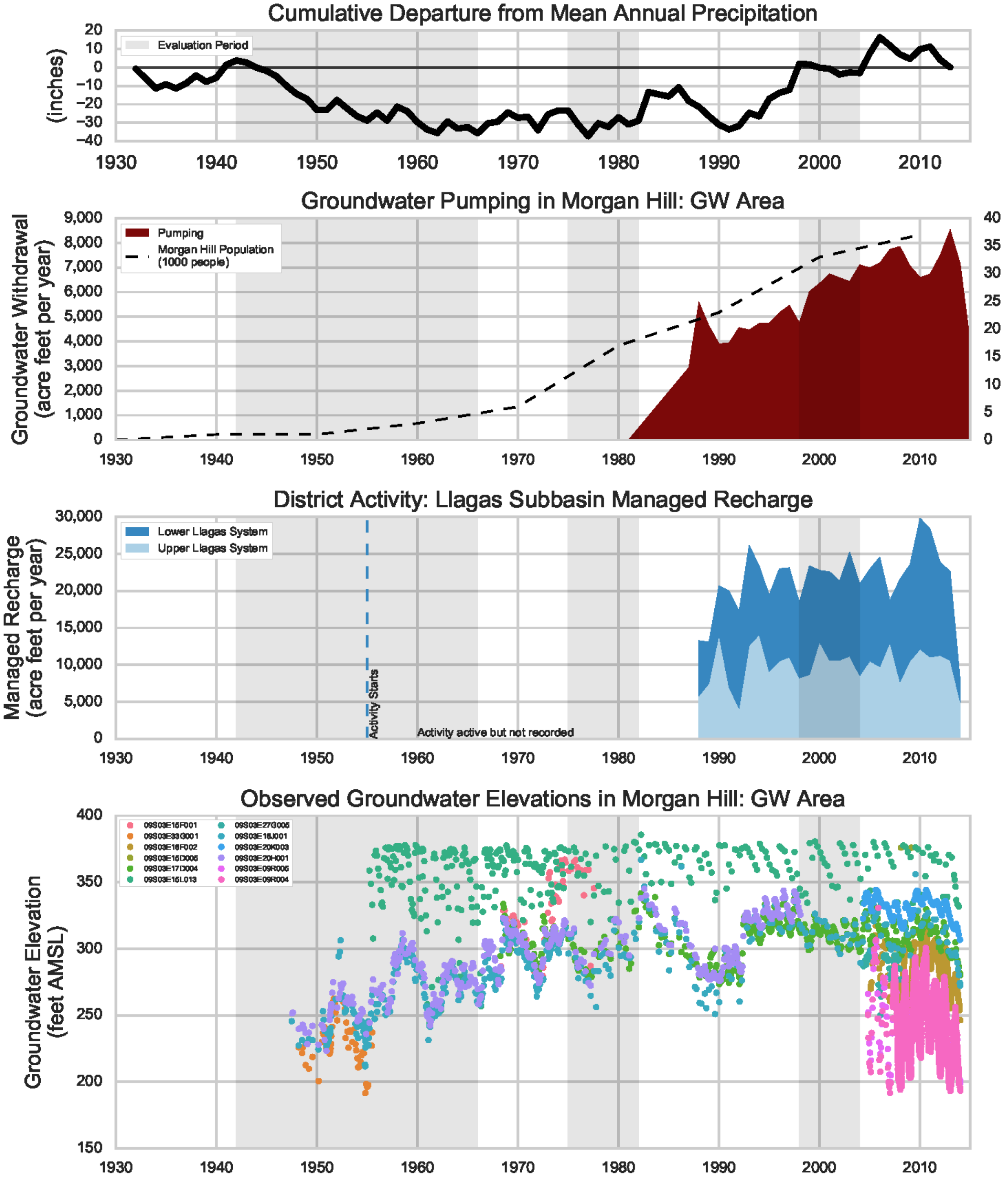
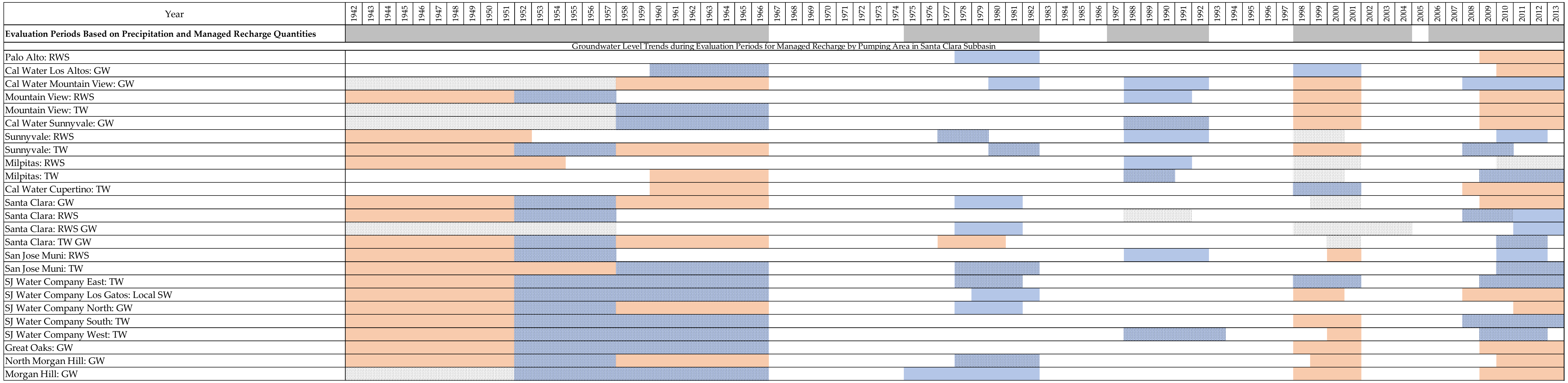


Figure 31. Example of Monitoring Well Groundwater Level Trend Evaluation for Managed Recharge in the Llagas Subbasin

MONTGOMERY
& ASSOCIATES

Table 5. Summary of Monitoring Well Groundwater Level Trends during Evaluation Periods for Managed Recharge by Pumping Area in Santa Clara Subbasin



Year	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Evaluation Periods Based on Precipitation and Managed Recharge Quantities	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									■	■	■
	Groundwater Level Trends during Evaluation Periods for Managed Recharge by Pumping Area in Santa Clara Subbasin																																			
Palo Alto: RWS																																				
Cal Water Los Altos: GW																			▦	▦	▦	▦	▦	▦	▦											
Cal Water Mountain View: GW	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧											
Mountain View: RWS	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦																				
Mountain View: TW	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	▦	▦	▦	▦	▦	▦	▦	▦	▦											
Cal Water Sunnyvale: GW	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	▦	▦	▦	▦	▦	▦	▦	▦	▦											
Sunnyvale: RWS	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧																									▦
Sunnyvale: TW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧											
Milpitas: RWS	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧																							
Milpitas: TW																			🟧	🟧	🟧	🟧	🟧	🟧	🟧											
Cal Water Cupertino: TW																			🟧	🟧	🟧	🟧	🟧	🟧	🟧											
Santa Clara: GW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧											
Santa Clara: RWS	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦																				
Santa Clara: RWS GW	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░																				
Santa Clara: TW GW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧											🟧
San Jose Muni: RWS	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦																				
San Jose Muni: TW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	▦	▦	▦											
SJ Water Company East: TW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦											
SJ Water Company Los Gatos: Local SW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦											
SJ Water Company North: GW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧											
SJ Water Company South: TW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦											
SJ Water Company West: TW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦											
Great Oaks: GW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦											
North Morgan Hill: GW	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧	🟧											
Morgan Hill: GW	░	░	░	░	░	░	░	░	░	░	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦									🟦	🟦	🟦

Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Evaluation Periods Based on Precipitation and Managed Recharge Quantities	■	■	■	■	■					■	■	■	■	■	■						■	■	■	■	■	■	■		■	■	■	■	■	■	■	■
Palo Alto: RWS	🟦	🟦	🟦	🟦	🟦																											🟧	🟧	🟧	🟧	🟧
Cal Water Los Altos: GW																					🟦	🟦	🟦	🟦									🟧	🟧	🟧	🟧
Cal Water Mountain View: GW			🟦	🟦	🟦						🟦	🟦	🟦	🟦	🟦						🟧	🟧	🟧	🟧							🟦	🟦	🟦	🟦	🟦	🟦
Mountain View: RWS											🟦	🟦	🟦	🟦							🟧	🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧
Mountain View: TW																					🟧	🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧
Cal Water Sunnyvale: GW											▦	▦	▦	▦	▦						🟧	🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧
Sunnyvale: RWS	▦	▦									🟦	🟦	🟦	🟦	🟦						░	░	░										🟦	🟦	🟦	
Sunnyvale: TW			▦	▦	▦																🟧	🟧	🟧	🟧							▦	▦	▦			
Milpitas: RWS											🟦	🟦	🟦	🟦							░	░	░	░									░	░	░	░
Milpitas: TW											▦	▦	▦								░	░	░									▦	▦	▦	▦	▦
Cal Water Cupertino: TW																					▦	▦	▦	▦							🟧	🟧	🟧	🟧	🟧	🟧
Santa Clara: GW	🟦	🟦	🟦	🟦																		░	░	░								🟧	🟧	🟧	🟧	🟧
Santa Clara: RWS											░	░	░	░																	▦	▦	▦	🟦	🟦	🟦
Santa Clara: RWS GW	🟦	🟦	🟦	🟦																	░	░	░	░	░	░	░							🟦	🟦	🟦
Santa Clara: TW GW	🟧	🟧	🟧																				░	░									▦	▦	▦	
San Jose Muni: RWS											🟦	🟦	🟦	🟦	🟦								🟧	🟧									🟦	🟦	🟦	
San Jose Muni: TW	▦	▦	▦	▦	▦																												▦	▦	▦	▦
SJ Water Company East: TW	▦	▦	▦	▦																	▦	▦	▦	▦								▦	▦	▦	▦	▦
SJ Water Company Los Gatos: Local SW		🟦	🟦	🟦	🟦																🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧	🟧
SJ Water Company North: GW	🟦	🟦	🟦	🟦																														🟧	🟧	🟧
SJ Water Company South: TW																					🟧	🟧	🟧	🟧							▦	▦	▦	▦	▦	▦
SJ Water Company West: TW											▦	▦	▦	▦	▦	▦							🟧	🟧								▦	▦	▦	▦	
Great Oaks: GW																					🟧	🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧
North Morgan Hill: GW	▦	▦	▦	▦	▦																	🟧	🟧	🟧									🟧	🟧	🟧	🟧
Morgan Hill: GW	🟦	🟦	🟦	🟦	🟦																🟧	🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧

🟧	**Decreasing**
🟦	**Stable/Increasing but Overlapping Activities**
▦	**Stable/Increasing Not Overlapping - Benefit Demonstrated**
▨	**Increasing Attributable to Overlapping Activity -Benefit Demonstrated**
░	**Insufficient Data - Lacking Groundwater Level Data**
	Not Evaluated Based on Pumping, Precipitation and Managed Recharge Quantities

TW= Retailer supplied by District treated water
RWS= Retailer supplied by SFPUC Regional Water System
Local SW= Retailer supplied by retailer surface water right
GW=Retailer supplied by groundwater
Cal Water: Los Altos TW and San Jose Muni: GW do not have data available during evaluation periods
Purissima Hills: GW, SJ Water Company Saratoga: Local SW, Open Space: GW do not have available data

Table 6. Summary of Monitoring Well Groundwater Level Trends during Evaluation Periods for Treated Water by Pumping Area in Santa Clara Subbasin

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Evaluation Periods Based on Precipitation or Treated Water Quantities	▒	▒	▒	▒	▒	▒	▒	▒				▒	▒	▒	▒	▒	▒	▒						▒	▒	▒	▒	▒	▒	▒		▒	▒	▒	▒	▒	▒	▒	▒
Groundwater Level Trends during Evaluation Periods for Treated Water Delivery by Pumping Area in Santa Clara Subbasin																																							
Palo Alto: RWS				🟦	🟦	🟦	🟦	🟦				🟧	🟧	🟧	🟧	🟧	🟧	🟧																	🟧	🟧	🟧	🟧	🟧
Cal Water Los Altos: GW												▩	▩	▩										🟦	🟦	🟦	🟦	🟦	🟦	🟦						🟧	🟧	🟧	🟧
Cal Water Mountain View: GW						🟦	🟦	🟦				▨	▨	▨	▨	▨	▨	▨						🟧	🟧	🟧	🟧	🟧	🟧	🟧						🟦	🟦	🟦	🟦
Mountain View: RWS												🟦	🟦	🟦	🟦	🟦	🟦							🟧	🟧	🟧	▩	▩	▩	▩					🟧	🟧	🟧	🟧	🟧
Cal Water Sunnyvale: GW																								🟧	🟧	🟧	🟧	🟧	🟧	🟧					🟦	🟦	🟦	🟦	🟦
Sunnyvale: RWS													▨	▨	▨	▨	▨	▨						░	░	░										▨	▨	▨	
Milpitas: RWS	▩	▩	▩	▩	▩	▩	▩	▩				🟦	🟦	🟦	🟦	🟦	🟦							░	░	░	░	░	░	░						░	░	░	░
Santa Clara: GW	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦																	░	░	░								🟧	🟧	🟧	🟧	🟧
Santa Clara: RWS GW	🟦	🟦	🟦	🟦	🟦	🟦	🟦																	░	░	░	░	░	░	░							🟦	🟦	🟦
San Jose Muni: RWS												▨	▨	▨	▨	▨	▨	▨								░	░	░	░							▨	▨	▨	
SJ Water Company Los Gatos: Local SW					🟦	🟦	🟦	🟦																🟧	🟧	🟧	🟧	🟧	🟧	🟧					🟧	🟧	🟧	🟧	🟧
SJ Water Company North: GW	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦																													🟧	🟧	🟧
Great Oaks: GW	▩	▩	▩	▩	▩	▩	▩	▩																🟧	🟧	🟧	🟧	🟧	🟧	🟧					🟧	🟧	🟧	🟧	🟧
Morgan Hill: GW	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦				🟧	🟧	🟧	🟧	🟧	🟧	🟧						🟧	🟧	🟧	🟧	🟧	🟧	🟧					🟧	🟧	🟧	🟧	🟧
North Morgan Hill: GW												🟧	🟧	🟧	🟧	🟧	🟧	🟧							🟧	🟧	🟧	🟧	🟧	🟧						🟧	🟧	🟧	🟧

🟧	**Decreasing**
🟦	**Stable/Increasing but Overlapping Activities**
▩	**Stable/Increasing Not Overlapping - Benefit Demonstrated**
▨	**Increasing Attributable to Overlapping Activity -Benefit Demonstrated**
░	**Insufficient Data - Lacking Groundwater Level Data**
	Not Evaluated Based on Pumping, Precipitation and Managed Recharge Quantities

TW= Retailer supplied by District treated water
RWS= Retailer supplied by SFPUC Regional Water System
Local SW= Retailer supplied by retailer surface water right
GW=Retailer supplied by groundwater
Santa Clara: RWS does not have data available during evaluation periods
Purissima Hills: GW, SJ Water Company Saratoga: Local SW, Open Space: GW do not have available data

Table 7. Summary of Monitoring Well Groundwater Level Trends during Evaluation Periods for Managed Recharge by Pumping Area in Llagas Subbasin

Year	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Evaluation Periods Based on Precipitation and Manged Recharge Quantities	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓									▓	▓	▓
	Groundwater Level Trends during Evaluation Periods for Managed Recharge by Pumping Area in Llagas Subbasin																																			
Morgan Hill: GW	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦									🟦	🟦	🟦
Eastern Llagas: (North and East of Gilroy)	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░									▩	▩	▩
Gilroy: GW	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░	░									▩	▩	▩

Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Evaluation Periods Based on Precipitation and Manged Recharge Quantities	▓	▓	▓	▓	▓					▓	▓	▓	▓	▓	▓						▓	▓	▓	▓	▓	▓	▓		▓	▓	▓	▓	▓	▓	▓	▓
Morgan Hill: GW	🟦	🟦	🟦	🟦	🟦																🟧	🟧	🟧	🟧	🟧	🟧	🟧									
Eastern Llagas: (North and East of Gilroy)	▩	▩	▩	▩	▩						🟧	🟧	🟧	🟧	🟧						▩	▩	▩	▩	▩	▩	▩									
Gilroy: GW	▩	▩	▩	▩	▩																🟧	🟧	🟧	🟧	🟧	🟧	🟧		▩	▩	▩	▩	▩			

🟧	**Decreasing**
🟦	**Stable/Increasing but Overlapping Activities**
▦	**Stable/Increasing Not Overlapping - Benefit Demonstrated**
▩	**Increasing Attributable to Overlapping Activity -Benefit Demonstrated**
░	**Insufficient Data - Lacking Groundwater Level Data**
	Not Evaluated Based on Pumping, Precipitation and Managed Recharge Quantities

GW=Retailer supplied by groundwater
Uvas-Chesbro does not have available data

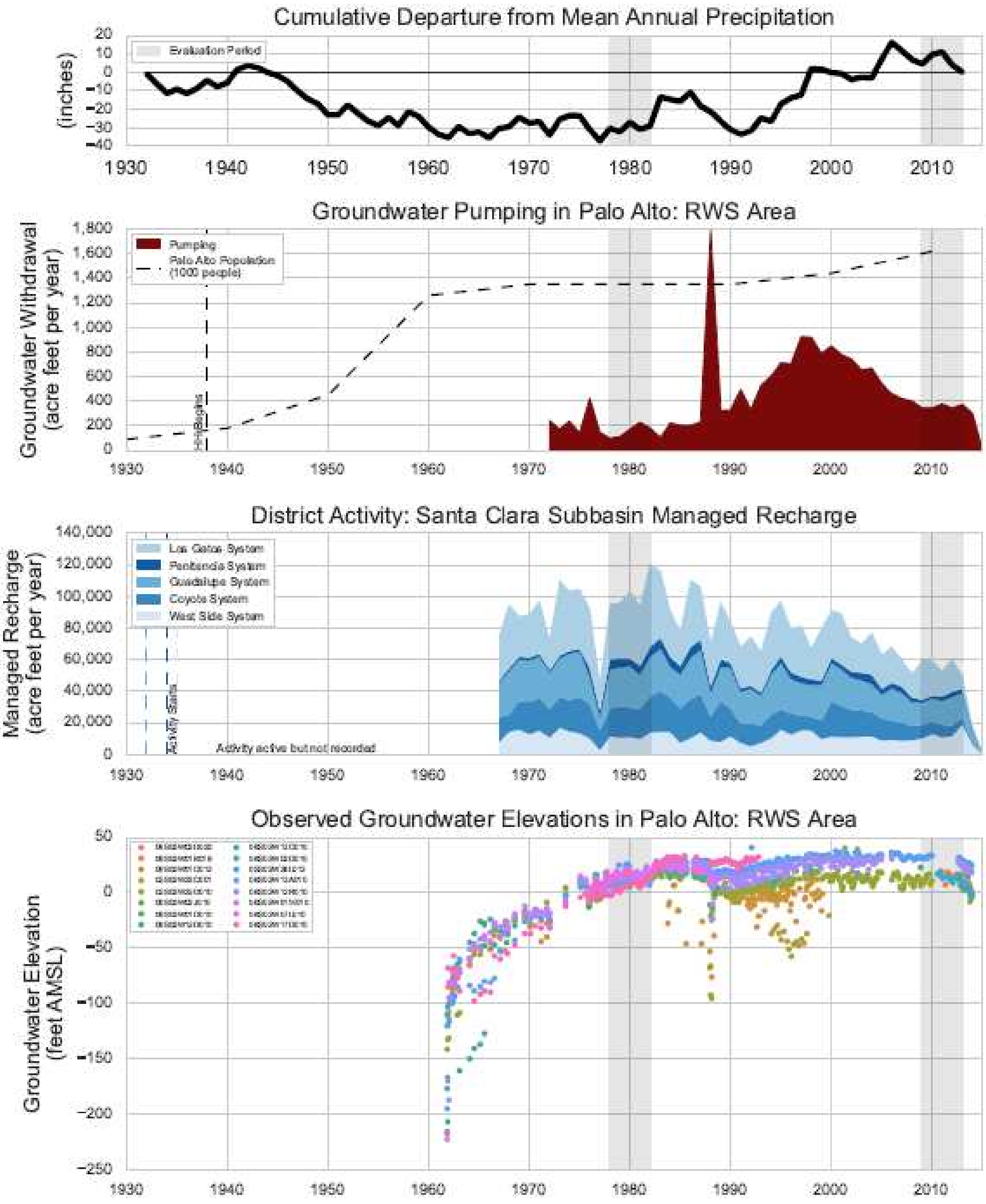
8.2.2 Pumping Well Groundwater Level Trends for Selected Areas

The Study evaluates monitoring wells that do not have associated pumping data because pumping at the individual well can mask any groundwater trends in the area. However, there are a few areas where monitoring wells with data during evaluated periods do not fully cover the area. These areas are Palo Alto, Stanford, Milpitas, the Los Gatos area of San Jose Water Company receiving the company's surface water, the Edenvale area of City of San Jose Municipal receiving only groundwater and the part of the Eastern Llagas area south of Gilroy. In these areas, Appendix F includes plots of groundwater levels from wells with associated pumping data during evaluation periods. Example figures from Appendix F are shown on Figure 32 for managed recharge in the Santa Clara Subbasin, Figure 33 for treated water in the Santa Clara Subbasin, and Figure 34 for managed recharge in the Llagas Subbasin.

8.2.3 Areas Where Benefits are Not Demonstrated by Groundwater Level Trends

For the evaluation of benefits from treated water deliveries in the north Morgan Hill non-retailer area between San Jose and Morgan Hill in Coyote Valley, three monitoring wells with data during three evaluation periods show decreasing trends. This may indicate that benefits do not extend from the District deliveries of treated water north of Coyote Narrows into Coyote Valley.

Pumping Area: Palo Alto: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells



Cumulative Departure from Mean Annual Precipitation
(inches)
20
10
0
−10
−20
−30
−40
Evaluation Period
1930
1940
1950
1960
1970
1980
1990
2000
2010
Groundwater Pumping in Palo Alto: RWS Area
Groundwater Withdrawal (acre feet per year)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Pumping
Palo Alto Population (1000 people)
Pumping Begins
70
60
50
40
30
20
10
District Activity: Santa Clara Subbasin Managed Recharge
Managed Recharge (acre feet per year)
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Los Gatos System
Penitencia System
Guadalupe System
Coyote System
West Side System
Activity Starts
Activity active but not recorded
Observed Groundwater Elevations in Palo Alto: RWS Area
Groundwater Elevation (feet AMSL)
50
0
−50
−100
−150
−200
−250

Figure 32. Example of Pumping Well Groundwater Level Trend Evaluation of Managed Recharge in the Santa Clara Subbasin

Pumping Area: Milpitas: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitored Pumping Wells

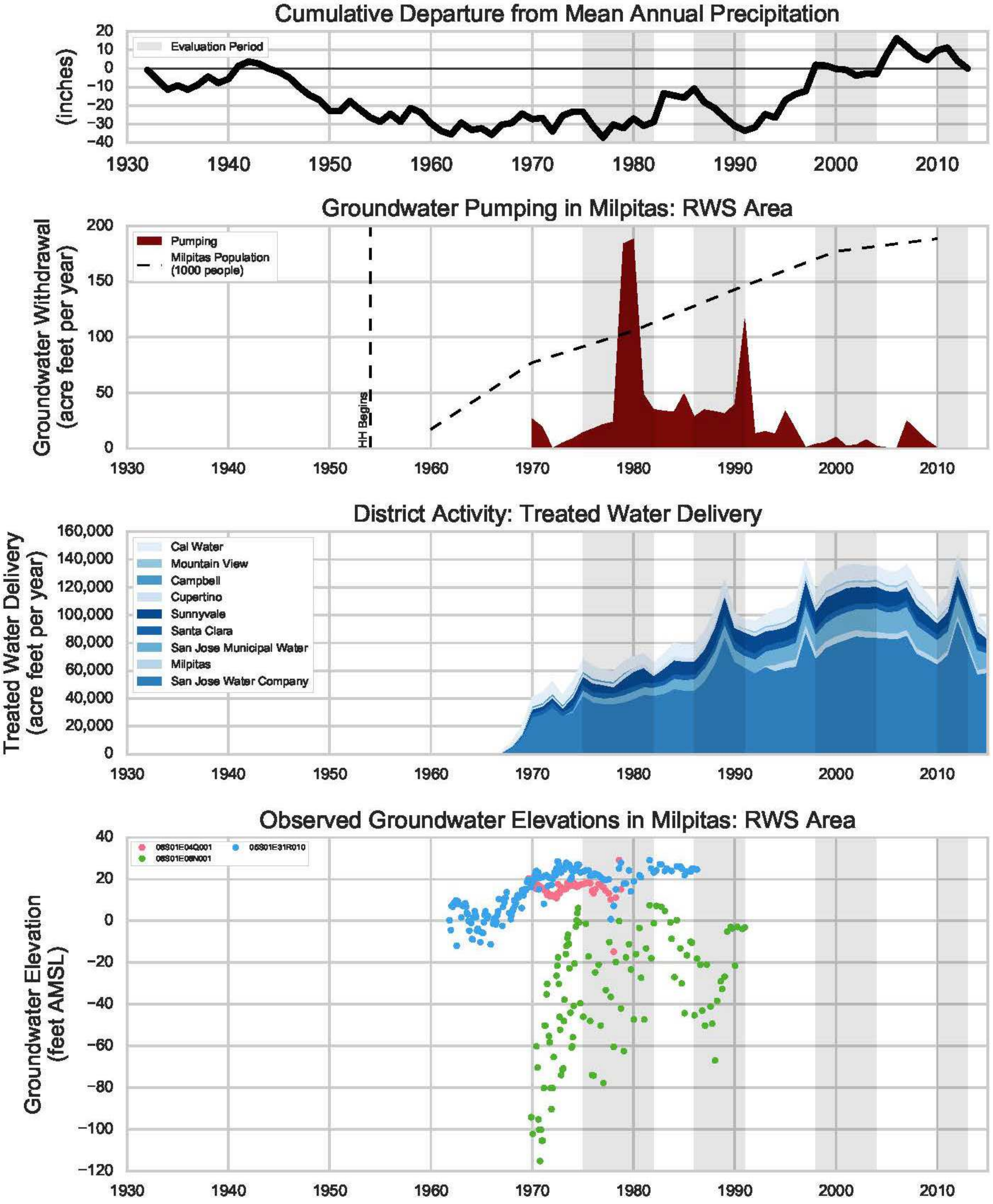
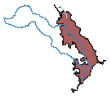


Figure 33. Example of Pumping Well Groundwater Level Trend Evaluation of Treated Water in the Santa Clara Subbasin

Pumping Area: Eastern Llagas:
Activity: Llagas Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells



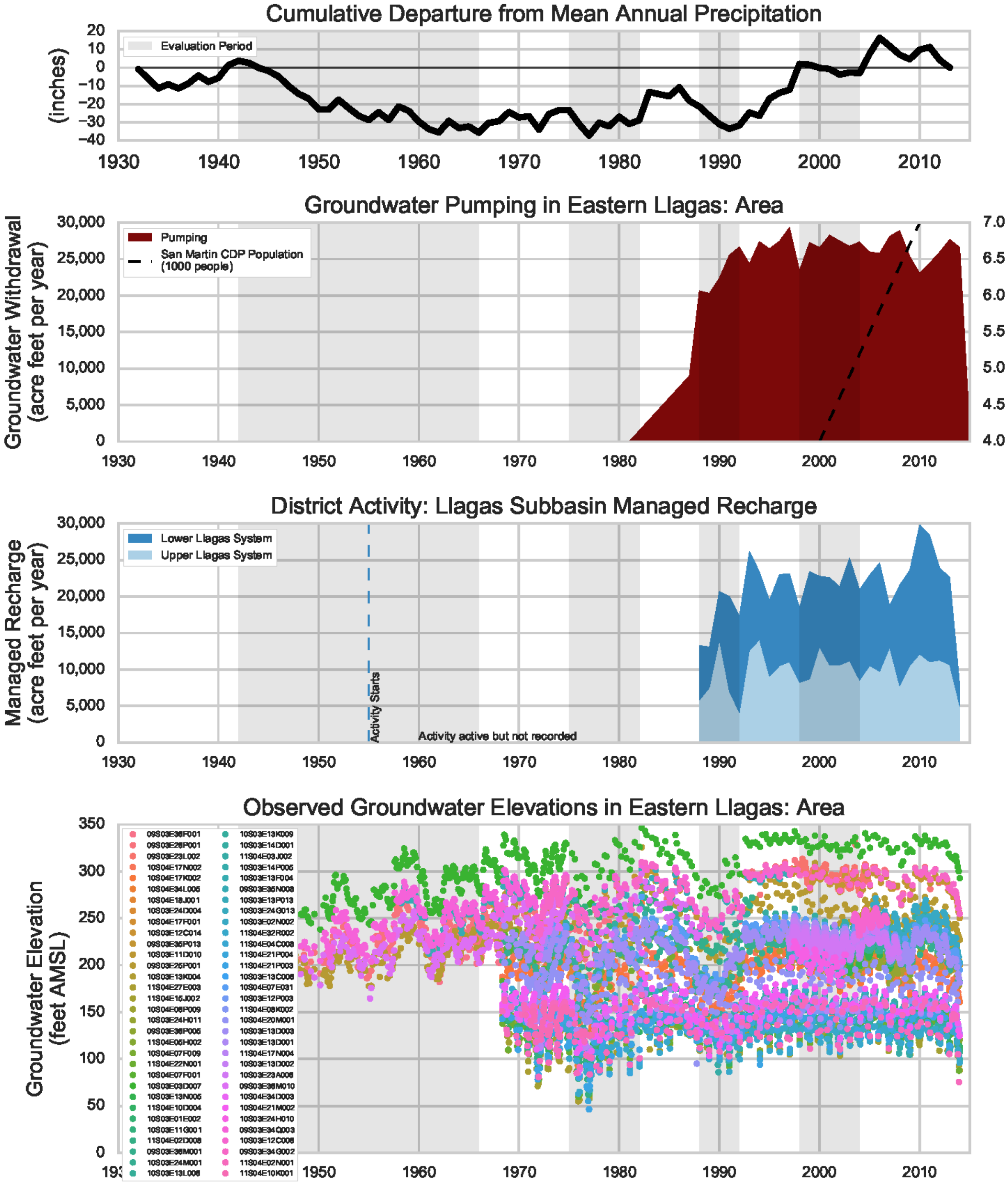


Figure 34. Example of Pumping Well Groundwater Level Trend Evaluation of Managed Recharge in the Llagas Subbasin

Table 8. Summary of Pumping Well Groundwater Level Trends for Selected Pumping Areas

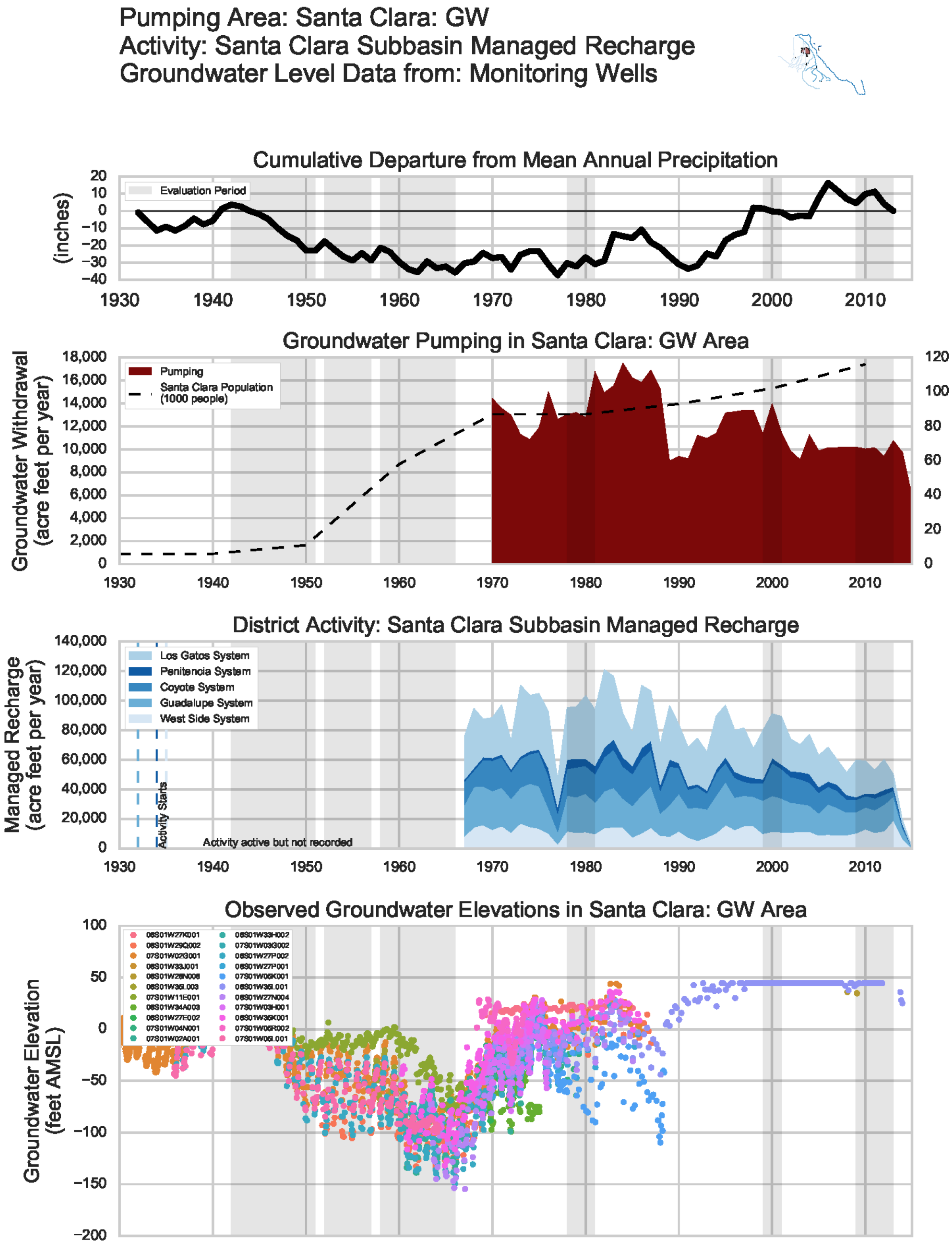
Year	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Evaluation Periods Based on Precipitation and District Activity Quantities	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓										▓	▓	▓	▓	▓	▓	▓	▓					▓	▓	▓	▓	▓	▓						▓	▓	▓	▓	▓	▓	▓		▓	▓	▓	▓	▓	▓	▓	▓
Groundwater Level Trends during Evaluation Periods for Managed Recharge by Pumping Area in Santa Clara Subbasin																																																																								
Stanford: RWS																																					🟦	🟦	🟦	🟦	🟦																░	░	░	░										🟧	🟧	🟧
Palo Alto: RWS																																					🟦	🟦	🟦	🟦	🟦																											🟧	🟧	🟧	🟧	🟧
Milpitas: TW	░	░	░	░	░	░	░	░	░	░	░	░	░						🟧	🟧	🟧	🟧	🟧	🟧	🟧																						▦	▦	▦								░	░	░										░	░	░	░
San Jose Muni: GW	▦	▦	▦	▦	▦	▦	▦	▦	▦	🟧	🟧	🟧	🟧	🟧	🟧	🟧	▦	▦	▦	▦	▦	▦	▦	▦	▦											🟦	🟦	🟦	🟦	🟦	🟦						🟧	🟧	🟧	🟧	🟧						🟦	🟦														
SJ Water Company Los Gatos: Local SW	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦												🟦	🟦	🟦	🟦																	🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧	🟧
Groundwater Level Trends during Evaluation Periods for Treated Water Delivery by Pumping Area in Santa Clara Subbasin																																																																								
Stanford: RWS																																					🟦	🟦	🟦	🟦	🟦																░	░	░	░										🟧	🟧	🟧
Palo Alto: RWS																																					🟦	🟦	🟦	🟦	🟦				🟧	🟧	🟧	🟧	🟧	🟧	🟧																	🟧	🟧	🟧	🟧	🟧
Milpitas: RWS																																		▦	▦	▦	▦	▦	▦	▦	▦				▦	▦	▦	▦	▦	▦							░	░	░	░	░	░	░						░	░	░	░
San Jose Muni: GW																																		🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦				🟧	🟧	🟧	🟧	🟧	🟧	🟧						🟧	🟧														
SJ Water Company Los Gatos: Local SW																																						🟦	🟦	🟦	🟦																🟧	🟧	🟧	🟧	🟧	🟧	🟧					🟧	🟧	🟧	🟧	🟧
Groundwater Level Trends during Evaluation Periods for Managed Recharge by Pumping Area in Llagas Subbasin																																																																								
Eastern Llagas: (South of Gilroy)	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦	▦									▦	▦	▦	▦	▦	▦								🟧	🟧	🟧	🟧	🟧						🟧	🟧	🟧	🟧	🟧	🟧	🟧									

🟧	**Decreasing**
🟦	**Stable/Increasing but Overlapping Activities**
▦	**Stable/Increasing Not Overlapping - Benefit Demonstrated**
▨	**Increasing Attributable to Overlapping Activity -Benefit Demonstrated**
░	**Insufficient Data - Lacking Groundwater Level Data**
	Not Evaluated Based on Pumping, Precipitation and District Activity Quantities

8.2.4 Areas Where Benefits are only Demonstrated by Groundwater Level Trends during Overlapping Periods

There are several areas where groundwater level trends indicate a benefit from either managed recharge, treated water deliveries, or both. These areas have stable or increasing groundwater level trends during evaluation periods that overlap in the evaluation of both managed recharge and treated water deliveries. For at least one of the activities, there is no stable or increasing groundwater level trend for a period that is not overlapping so benefit cannot be attributed specifically to the activity unless specific conditions are met. For example, the City of Santa Clara area that only receives groundwater has an increasing groundwater level trend from 1978-1981, which is a period evaluated for both managed recharge and treated water deliveries. A stable groundwater level trend is observed for 1952-1957 so benefit is demonstrated from managed aquifer recharge for periods other than the overlapping period (Figure 35). However, no evaluation periods besides the overlapping period have enough data to evaluate treated water delivery benefits (Figure 36). Therefore, the benefit cannot be attributed specifically to treated water deliveries based on the groundwater level trends for this area. Table 9 shows the areas where groundwater level trends show benefit from District activities during overlapping periods, but benefits cannot be distinguished as resulting specifically from one or both of the activities.

A benefit can be specifically attributed to an activity where benefits are demonstrated only during overlapping periods if the activity is increasing while the other activity is stable and groundwater level trends are increasing. This occurs in the areas of Cal Water Mountain View where groundwater is delivered and Sunnyvale and San Jose Municipal Alviso area where Regional Water System water is delivered. For the 1987-1992 and 2010-2012 periods, treated water deliveries increased (Figure 37) while managed aquifer recharge quantities were stable (Figure 38). Meanwhile, groundwater level trends increase in at least one of the two periods for the three areas. Therefore, the benefit can be attributed specifically to treated water deliveries is demonstrated for these three areas. Table 9 also shows the areas where groundwater level trends show benefit from District activities during overlapping periods and benefits specific to the activities are demonstrated.



Pumping Area: Santa Clara: GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

Cumulative Departure from Mean Annual Precipitation

Groundwater Pumping in Santa Clara: GW Area

District Activity: Santa Clara Subbasin Managed Recharge

Observed Groundwater Elevations in Santa Clara: GW Area

Figure 35. Example of Monitoring Well Groundwater Level Trends Demonstrating Benefits from Managed Recharge Overlapping with a Period Demonstrating Benefits from Treated Water

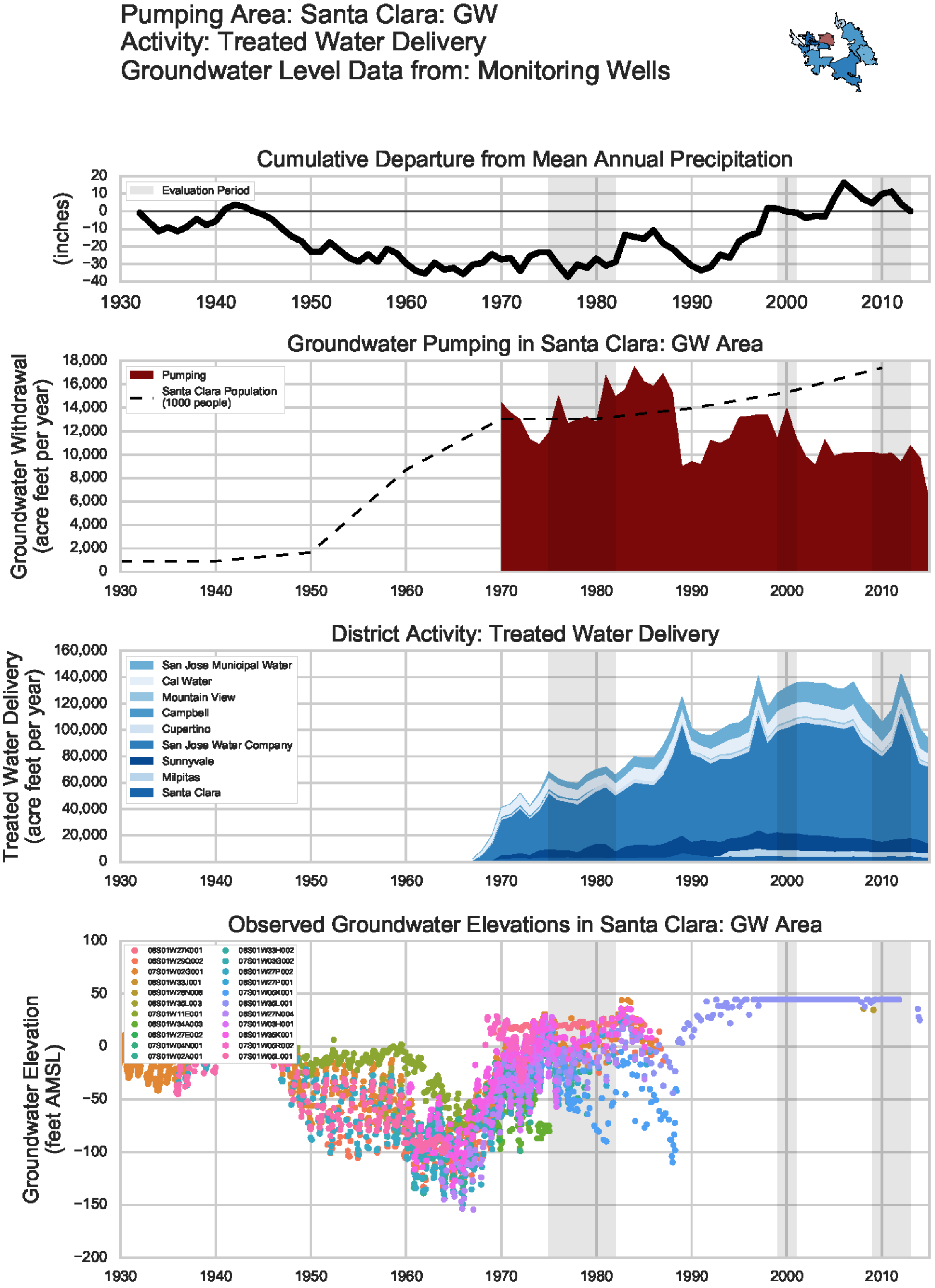
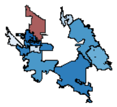


Figure 36. Example of Monitoring Well Groundwater Level Trends Demonstrating Benefits from Treated Water Only in an Overlapping Period

Pumping Area: Sunnyvale: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



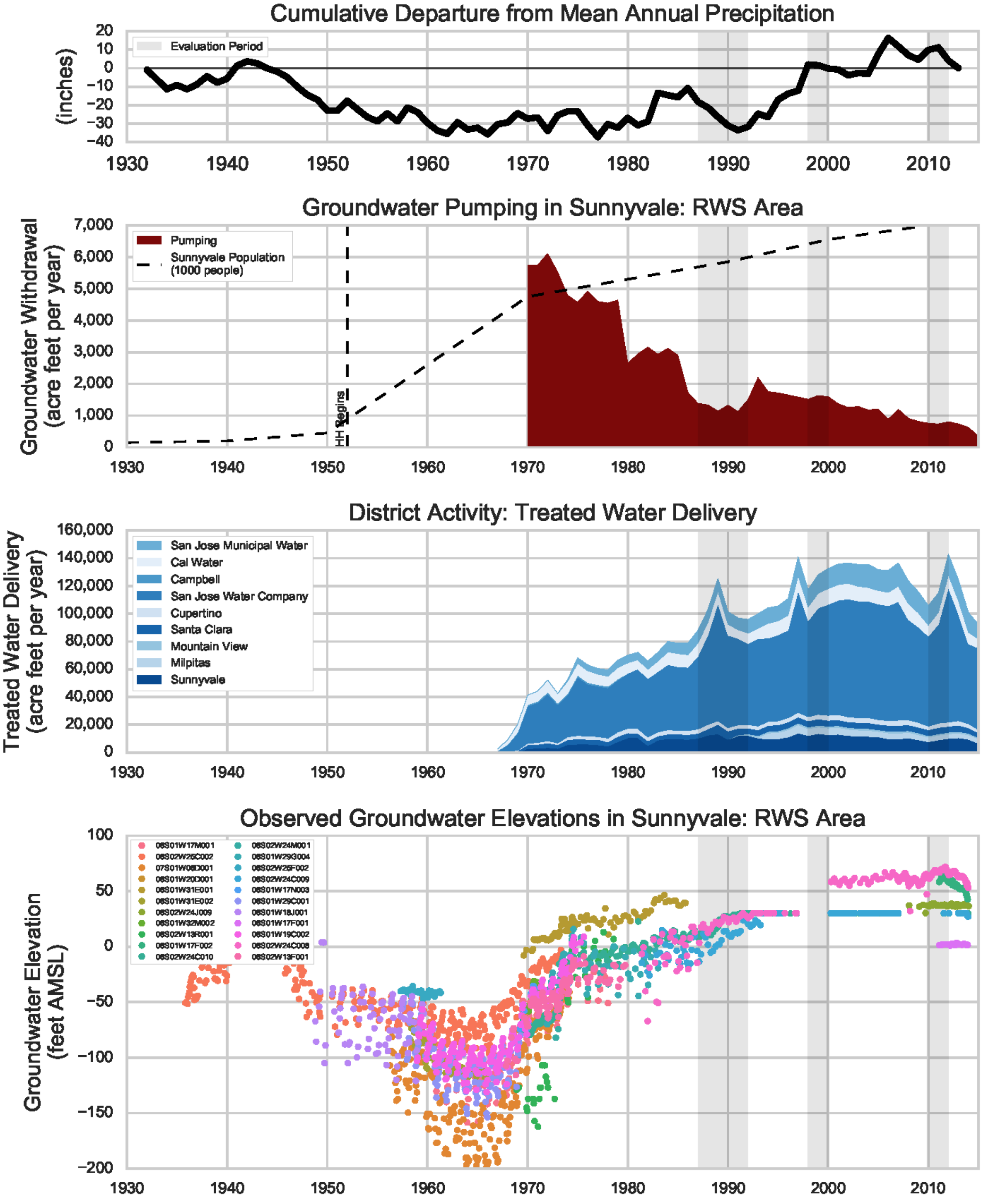


Figure 37. Example of Monitoring Well Groundwater Level Trends Demonstrating Benefits from Treated Water with Increasing Treated Water Deliveries during Overlapping Periods

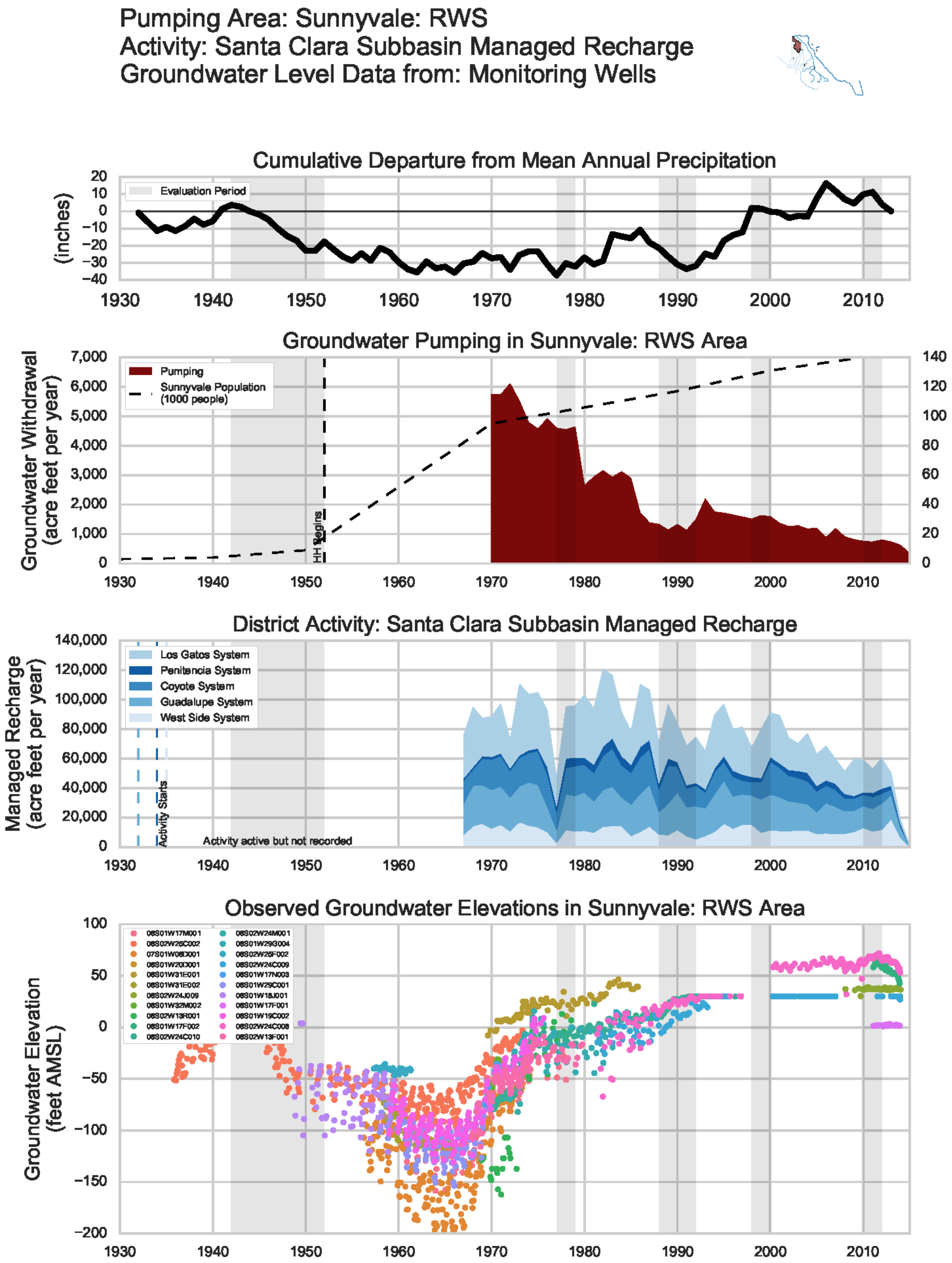


Figure 38. Example of Monitoring Well Groundwater Level Trends Demonstrating Benefits from Managed Recharge with Overlapping Periods of Stable Manged Recharge

Table 9. Pumping Areas and District Activities where Groundwater Level Trends are Stable or Increasing Only During Evaluation Periods Overlapping with Different District Activity

Year	Pre-1975	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Evaluation Periods Based on Precipitation and District Activity Quantities		▒	▒	▒	▒	▒	▒	▒	▒					▒	▒	▒	▒	▒	▒						▒	▒	▒	▒	▒	▒	▒		▒	▒	▒	▒	▒	▒	▒	▒
Groundwater Level Trends during Evaluation Periods by Pumping Area in Santa Clara Subbasin																																								
Milpitas: RWS for Treated Water Delivery		▦	▦	▦	▦	▦	▦	▦	▦						🟦	🟦	🟦	🟦							░	░	░										░	░	░	░
Milpitas: RWS for Managed Recharge															🟦	🟦	🟦	🟦							░	░	░	░	░	░	░						░	░	░	░
Palo Alto: RWS for Treated Water Delivery					🟦	🟦	🟦	🟦	🟦				🟧	🟧	🟧	🟧	🟧	🟧	🟧						🟦	🟦	🟦	🟦	🟦							🟧	🟧	🟧	🟧	🟧
Palo Alto: RWS for Managed Recharge					🟦	🟦	🟦	🟦	🟦															🟦	🟦	🟦	🟦									🟧	🟧	🟧	🟧	🟧
Stanford: RWS for Treated Water Delivery					🟦	🟦	🟦	🟦	🟦																░	░	░	░										🟧	🟧	🟧
Stanford: RWS for Managed Recharge					🟦	🟦	🟦	🟦	🟦																░	░	░	░										🟧	🟧	🟧
Cal Water Mountain View: GW for Treated Water Delivery							🟦	🟦	🟦				▨	▨	▨	▨	▨	▨	▨						🟧	🟧	🟧	🟧	🟧	🟧	🟧						🟦	🟦	🟦	🟦
Cal Water Mountain View: GW for Managed Recharge							🟦	🟦	🟦						🟦	🟦	🟦	🟦	🟦						🟧	🟧	🟧	🟧							🟦	🟦	🟦	🟦	🟦	🟦
Santa Clara: RWS GW for Treated Water Delivery		🟦	🟦	🟦	🟦	🟦	🟦	🟦																														🟦	🟦	🟦
Santa Clara: RWS GW for Managed Recharge					🟦	🟦	🟦	🟦																														🟦	🟦	🟦
Cal Water Sunnyvale: GW for Treated Water Delivery																									🟧	🟧	🟧	🟧	🟧	🟧	🟧					🟦	🟦	🟦	🟦	🟦
Cal Water Sunnyvale: GW for Managed Recharge	▦														▦	▦	▦	▦	▦						🟧	🟧	🟧	🟧								🟦	🟦	🟦	🟦	🟦
Sunnyvale: RWS for Treated Water Delivery														▨	▨	▨	▨	▨	▨																		▨	▨	▨	
Sunnyvale: RWS for Managed Recharge				▦	▦	▦									🟦	🟦	🟦	🟦	🟦																		🟦	🟦	🟦	
Santa Clara: GW for Treated Water Delivery		🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦																	░	░	░								🟧	🟧	🟧	🟧	🟧
Santa Clara: GW for Managed Recharge	▦				🟦	🟦	🟦	🟦																		░	░	░								🟧	🟧	🟧	🟧	🟧
San Jose Muni: RWS for Treated Water Delivery													▨	▨	▨	▨	▨	▨	▨								░	░	░	░							▨	▨	▨	
San Jose Muni: RWS for Managed Recharge	▦														🟦	🟦	🟦	🟦	🟦								🟧	🟧									🟦	🟦	🟦	
SJ Water Company North: GW for Treated Water Delivery		🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦																													🟧	🟧	🟧
SJ Water Company North: GW for Managed Recharge	▦														🟦	🟦	🟦	🟦	🟦								🟧	🟧									🟦	🟦	🟦	
SJ Water Company Los Gatos: Local SW for Treated Water Delivery						🟦	🟦	🟦	🟦																🟧	🟧	🟧	🟧	🟧	🟧	🟧					🟧	🟧	🟧	🟧	🟧
SJ Water Company Los Gatos: Local SW for Managed Recharge	▦					🟦	🟦	🟦	🟦															🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧	🟧	🟧
San Jose Muni: GW for Treated Water Delivery						🟦	🟦																				░	░	░	░										
San Jose Muni: GW for Managed Recharge	▦					🟦	🟦	🟦	🟦															🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧	🟧	🟧
Morgan Hill: GW for Treated Water Delivery		🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦				🟧	🟧	🟧	🟧	🟧	🟧	🟧						🟧	🟧	🟧	🟧	🟧	🟧	🟧					🟧	🟧	🟧	🟧	🟧
Morgan Hill: GW for Managed Recharge	▦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦																🟧	🟧	🟧	🟧								🟧	🟧	🟧	🟧	🟧

🟧	**Decreasing**
🟦	**Stable/Increasing (Benefit from District Activities) but Can't Demonstrate Benefit from Specific Activity due to Overlapping Activities in Period**
▦	**Stable/Increasing Not Overlapping - Benefit Demonstrated**
▨	**Increasing Attributable to Overlapping Activity -Benefit Demonstrated**
░	**Insufficient Data - Lacking Groundwater Level Data**
	Not Evaluated Based on Pumping, Precipitation and District Activity Quantities

Several of the areas where benefits to specific activities are not demonstrated, Mountain View, Santa Clara, and San Jose Water Company North, are surrounded by areas that have demonstrated benefits from both managed recharge and treated water deliveries and can reasonably be assumed to also benefit from both activities due to hydrogeologic connection. Figure 39 and Figure 40 show the areas where the groundwater level trend evaluation demonstrates benefits that can be specifically attributed to each of managed aquifer recharge and treated water deliveries in relation to these areas.

The Palo Alto area shows stable groundwater levels for both 1978-1982 and 1998-2002 that are overlapping periods for evaluating benefits from both managed recharge and treated water deliveries in the Santa Clara Plain. The evaluation period for only treated water deliveries showed a decreasing trend. The groundwater level trends show a benefit from District activities in this area but the groundwater level trends for the area cannot be used to attribute the benefit to the specific activities. Groundwater modeling is used to evaluate the benefit of each of the two activities separately (Section 9).

Likewise, the Stanford area shows stable groundwater levels for 1978-1982 that is an overlapping period for evaluating benefits from treated water delivery and managed aquifer recharge activities. There is no evaluation period that can be used to distinguish between benefits of treated water deliveries and managed aquifer recharge activities. The groundwater level trends show a benefit from District activities in this area but the groundwater level trends for the area cannot be used to attribute the benefit to the specific activities. Groundwater modeling is used to evaluate the benefit of each of the two activities separately (Section 9).

The San Jose Water Company area in Los Gatos where the company’s local surface water is delivered shows stable groundwater levels for 1979-1982, that this is an overlapping period for evaluating benefits from both managed recharge and treated water deliveries. Stable or increasing trends occur during other evaluation periods for managed recharge but only decreasing trends occur for other evaluation periods for treated water deliveries. The groundwater level trends show a benefit from managed recharge in this area but the groundwater level trends for the areas cannot be used to attribute a benefit specifically to treated water deliveries.

Monitoring wells in Morgan Hill and production wells in the Coyote service area of San Jose Municipal Water receiving only groundwater both show increasing groundwater level trends only during 1975-1982, overlapping with evaluation of managed recharge. In the evaluation of managed recharge, other periods show groundwater level trends demonstrating benefit. These areas are in the Coyote Valley area where the north Morgan Hill area between San Jose and Morgan Hill does not have groundwater level trends demonstrating benefit from treated water delivery. In addition, the treated water delivery is north of Coyote Narrows where a steep groundwater gradient potentially limits hydrogeologic connection. Therefore, it is more likely that the increasing groundwater level trends occurring during 1975-1982 are a result of managed recharge from Coyote Creek in the Coyote Valley area instead of treated water delivery to the north of Coyote Narrows.

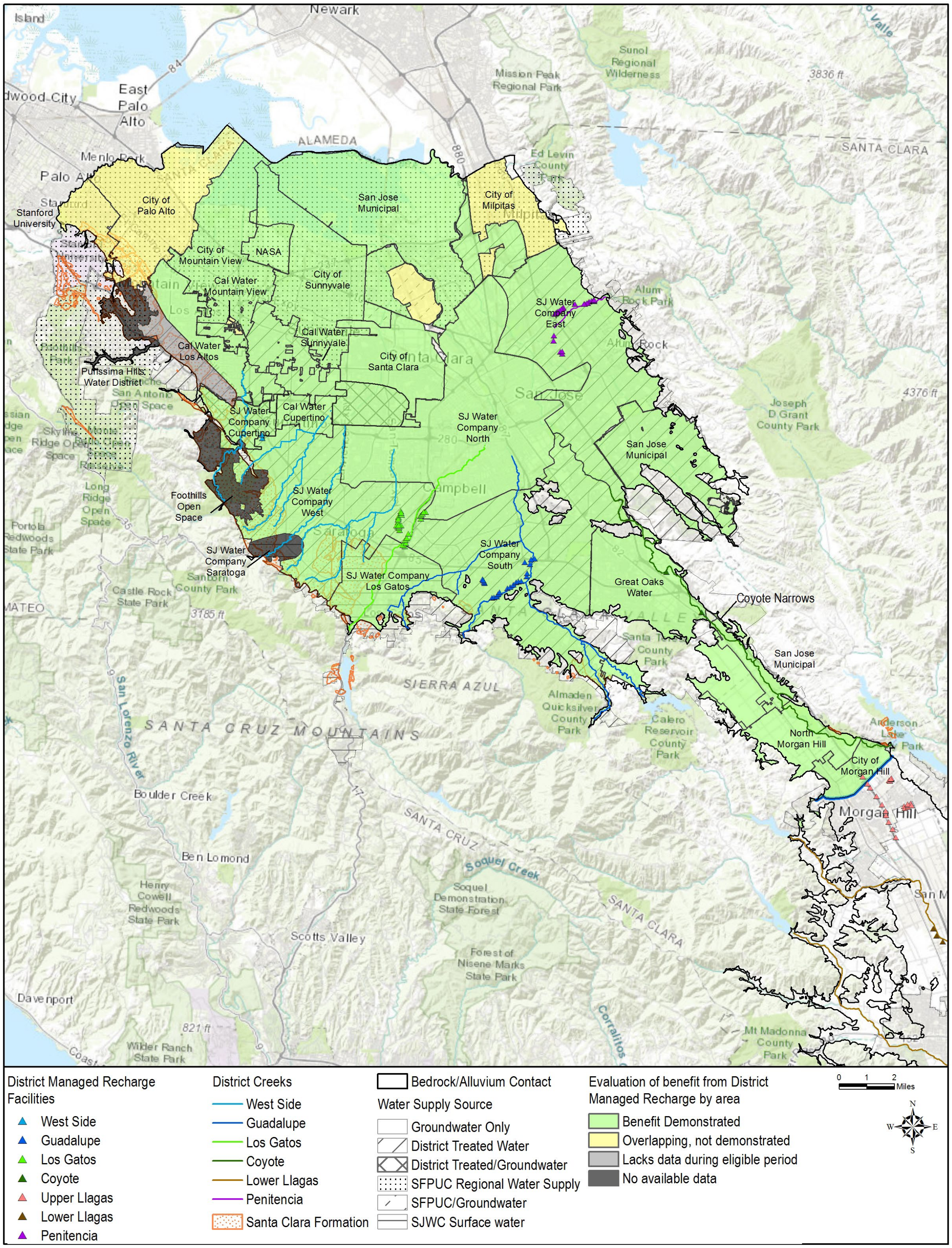


Figure 39. Results of Groundwater Level Trend Evaluation of Benefits from Managed Aquifer Recharge in Santa Clara Subbasin

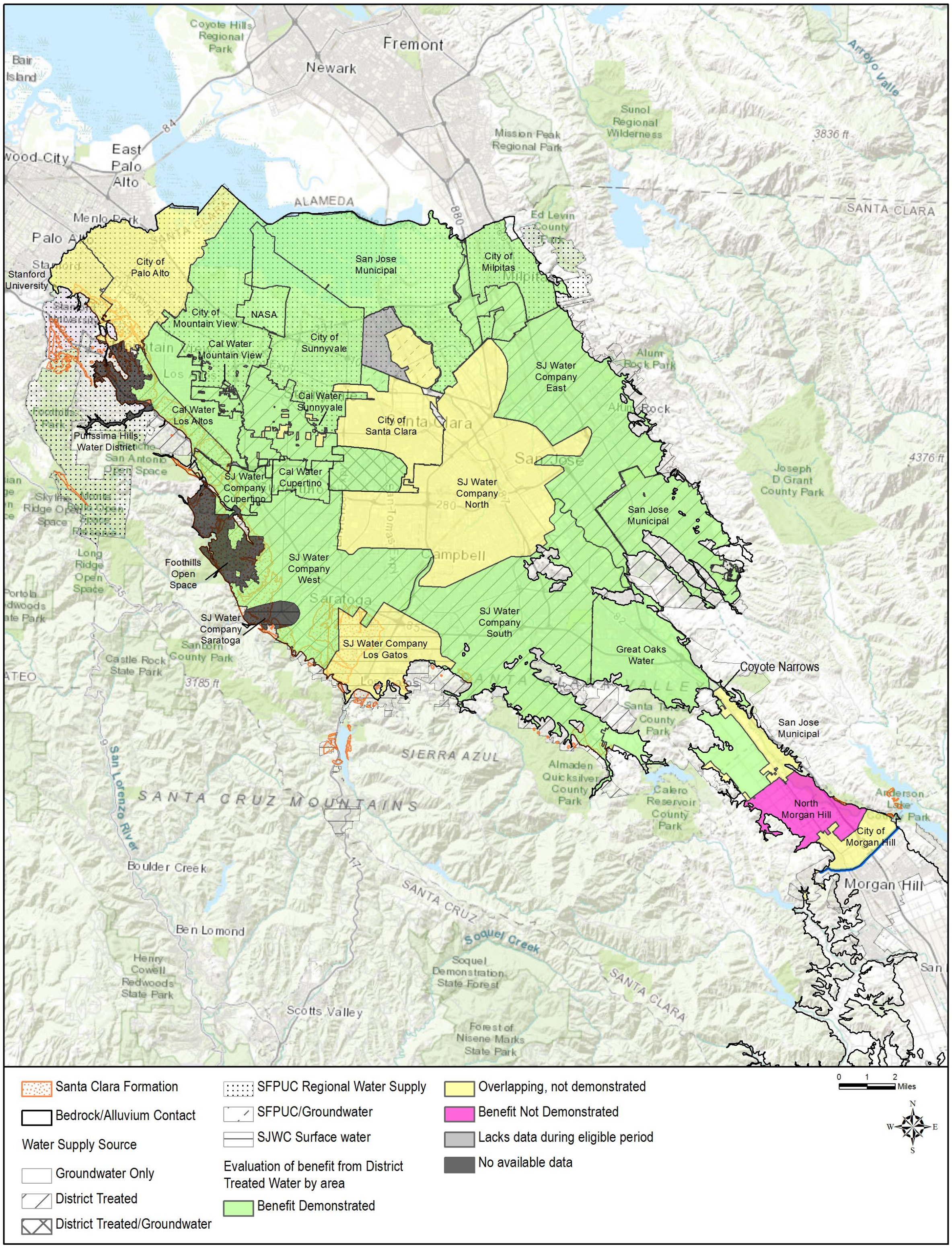


Figure 40. Results of Groundwater Level Trend Evaluation of Benefits from Treated Water Deliveries in Santa Clara Subbasin

8.3 Areas without Groundwater Level Data

8.3.1 Areas where Groundwater Level Data Unavailable during Evaluation Periods for Activities

There are two areas where groundwater level data are not available during evaluation periods for a District activity. These areas are the Los Altos area served District treated water by Cal Water and the small area of the City of Santa Clara where only SFPUC RWS water is delivered.

In the Cal Water Los Altos area where District treated water is delivered, there are no groundwater level data available for periods used to evaluate benefits from managed recharge (Appendix C). This area overlaps the Santa Clara Formation which may have limited hydrogeologic connection with managed recharge activities in the Unconsolidated Alluvium outside the Santa Clara Formation (Section 5.6).

In the small area of the City of Santa Clara where only SFPUC RWS water is delivered, there are no groundwater level data to evaluate trends during periods used to evaluate benefits from treated water deliveries (Appendix D). However, benefits from District treated water deliveries are demonstrated in hydrogeologically connected surrounding areas: Sunnyvale area where only SFPUC RWS water is delivered and City of San Jose Municipal where only SFPUC RWS water is delivered (Figure 40). Therefore, it is reasonable to assume that this area of the City of Santa Clara, even without local groundwater level data, also benefits from treated water deliveries.

8.3.2 Areas without Available Groundwater Level Data

There are areas where no groundwater level data are available. These areas include Purissima Hills, San Jose Water Company in Saratoga receiving surface water from the company’s own surface water right, the Open Space area and the Uvas-Chesbro area.

Purissima Hills Water District and Open Space area overlaps with bedrock and the Santa Clara Formation, while the surface water delivery area of San Jose Water Company in Saratoga overlap with bedrock, Santa Clara Formation, and Unconsolidated Alluvium. The Santa Clara Formation also has partial overlap with other areas including Palo Alto and San Jose Water Company in Los Gatos. There are no groundwater level data to evaluate in the Santa Clara Formation to evaluate hydrogeologic connection throughout the Santa Clara Formation. Bedrock is not considered to have hydrogeologic connection with District activities in other areas, while available information for the Santa Clara Formation does not support concluding that there is hydrogeologic connection with managed recharge activities in the Unconsolidated Alluvium (Section 5.6).

The Uvas-Chesbro area is west of bedrock outcrops in the Llagas Subbasin (Figure 41) which may limit the hydrogeologic connection with managed recharge of imported water that occurs east of the bedrock outcrops and groundwater level trends demonstrate benefits from managed recharge of imported water.

8.4 Statistical Analysis

In order to quantify the groundwater level trends used to demonstrate improvement, a Mann-Kendall test was performed for data at each well over the time period when a trend for the area of the well demonstrates improvement. The Mann-Kendall test is appropriate because it is non-parametric and does not rely on the distribution of the data set (Heisel and Hirsch, 2002).
The Mann-Kendall test statistic *tau* represents whether there is a trend detected on a scale from -1 to 1, with -1 representing a decreasing trend and 1 representing an increasing trend. The p_{adj} statistic represents the level of significance of the tau result on a scale from 0 to 1. Appendix G summarizes the Mann-Kendall statistics results by well grouped by retailer well area.

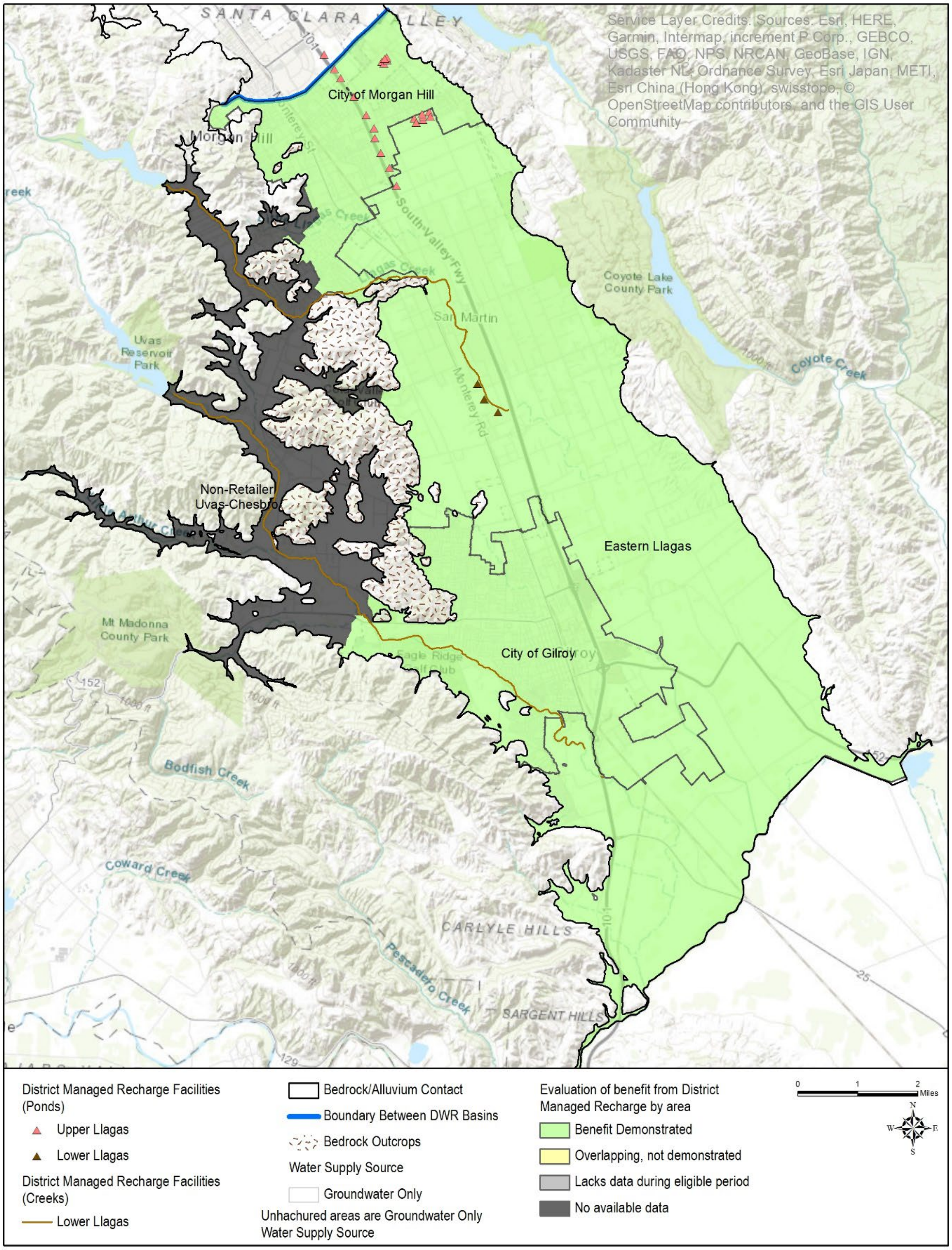

SANTA CLARA VALLEY
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community
City of Morgan Hill
Morgan Hill
Monterey St
South Valley Fwy
Llagas Creek
Coyote Lake County Park
Coyote Creek
Uvas Reservoir Park
San Martin
Monterey Rd
Non-Retailer Uvas-Chesbro
Eastern Llagas
Mt Madonna County Park
City of Gilroy
Eagle Ridge Golf Club
Bodfish Creek
Coward Creek
CARLYLE HILLS
Pescadero Creek
SARGENT HILLS
District Managed Recharge Facilities (Ponds)
Upper Llagas
Lower Llagas
District Managed Recharge Facilities (Creeks)
Lower Llagas
Bedrock/Alluvium Contact
Boundary Between DWR Basins
Bedrock Outcrops
Water Supply Source
Groundwater Only
Unhachured areas are Groundwater Only Water Supply Source
Evaluation of benefit from District Managed Recharge by area
Benefit Demonstrated
Overlapping, not demonstrated
Lacks data during eligible period
No available data
0
1
2
Miles
N
W
E
S

Figure 41. Results of Groundwater Level Trend Evaluation of Benefits from Managed Aquifer Recharge in Llagas Subbasin

9 GROUNDWATER MODEL SIMULATIONS

9.1 Groundwater Modeling Approach

The District ran simulations with its groundwater flow models for the Santa Clara Plain (CH2M Hill, 1992) and Llagas Subbasin (CH2M Hill, 2005) to evaluate the extent of benefits from District activities (Table 10). The groundwater flow models have been calibrated to historical data and are therefore appropriate for use to supplement the groundwater level data evaluation in Section 8 in evaluating effects of District activities on groundwater flow. Groundwater modeling facilitates the evaluation of benefits from a specific District activity without confounding effects from other groundwater conditions or activities. This is accomplished by comparing model runs with the District activity to model runs with the District activity removed or reduced. The model run with the District activity is represented by a baseline simulation of historical conditions that includes the District activity. The model run removing or reducing the District activity has the same inputs as the baseline except for the District activity.

Comparing model runs with the only change being the District activity provides a line of evidence supporting groundwater level data evaluation presented in Section 8 especially in areas where data are limited or there are overlapping evaluation periods that prevent assigning benefits to a specific District activity, and where District activities such as managed aquifer recharge of local water and imported water cannot be separated in the data. The model runs can also be used to evaluate benefits from recycled water activities, which has quantities that are too small to evaluate in the groundwater level data evaluation.

Model results depend on modeling assumptions used to create the models, particularly the model domain covered. Therefore, use of the model to demonstrate the extent of benefits needs to be consistent with the groundwater level evaluation described in Section 8.

The District's Coyote Valley model is not used for this evaluation. This model's simulation of the recharge from the Coyote Creek managed recharge system is based on stream levels that are not conducive to testing the effects of reduced recharge quantities. The groundwater level trend evaluation demonstrated a benefit from managed recharge in all areas the Coyote Valley so modeling results would only affirm that conclusion. The groundwater level trend evaluation did not demonstrate a benefit from treated water deliveries in the Santa Clara Plain. The model also cannot directly simulate deliveries in the Santa Clara Plain as the model's northern domain boundary is the Coyote Narrows.

Table 10. Summary of Groundwater Model Simulations Evaluated for Study

Model	Period	Scenario No.	District Activity Evaluated	Model Implementation for District Activity
Santa Clara Plain	1970-2015	1	None (Baseline)	Historical Pumping and Managed Recharge
		2	Treated Water Delivery	Increased Pumping by 50% of Treated Water Deliveries
		5	Managed Aquifer Recharge	Eliminates District Managed Aquifer Recharge
		6	Recycled Water	Increased Pumping in Areas Receiving Recycled Water
Llagas	1987-2015	Baseline	None (Baseline)	Historical Pumping and Managed Recharge
		1	Managed Aquifer Recharge of Local Runoff	Eliminates District Managed Aquifer Recharge of Local Runoff in Upper Llagas and Lower Llagas Systems
		2	Managed Aquifer Recharge of Imported Water	Eliminates District Managed Aquifer Recharge of Imported Water in Upper Llagas System
		4	Recycled Water	Increased Pumping in Areas Receiving Recycled Water

9.2 Santa Clara Plain Model Simulations

The District ran simulations using the Santa Clara Plain groundwater model following the approach outlined above. One of the main assumptions implemented in this model is that the domain covers the Unconsolidated Alluvium but does not cover most of the Santa Clara Formation outcrop area. The initial modeling is documented in the District's memo (Liu and Zhan, 2016) included as Appendix H. Any necessary revisions to the initial modeling are described below. The Study uses modeling that evaluates treated water deliveries (Scenario 2), managed aquifer recharge (Scenario 5), and recycled water deliveries (Scenario 6) separately. The Study does not use Scenarios 3 and 4 (documented in Appendix F) evaluating effects of recharging only imported water and only local runoff because all managed recharge systems in the Santa Clara Plain are connected to the imported water system and can recharge both imported water and local runoff. All runs simulate historical climatic conditions from 1970-2015.

9.2.1 Baseline

Scenario 1 simulates historical conditions from 1970-2015 for pumping and managed recharge. Results from all other scenarios are compared to this scenario to evaluate the extent of benefit from a specific District activity. This comparison is done by subtracting groundwater level results at the end of each of the other scenarios from the results at the end of this baseline run (Figure 42 through Figure 44). A positive difference in the groundwater levels indicate a benefit from the District activity because the baseline run includes the District activity as fully implemented historically. The Study evaluates each map of the groundwater level difference in

2015 for demonstrated extent of benefits. Yellow represents the minimum groundwater level difference of 0.6 feet across all scenarios when compared to the baseline scenario. Dark blue represents the maximum groundwater level difference of 124 feet across all scenarios when compared to the baseline scenario.

9.2.2 Reduced Treated Water Deliveries

Scenario 2 estimates the effects of reducing treated water deliveries by 50% by assuming that any reduced deliveries would be made up for with increased pumping. The model simulates this by increasing pumping by one half of treated water delivery quantities to simulate the decrease in in-lieu recharge from reduced treated water deliveries. The increases occur at selected wells of retailers that have received treated water deliveries. Treated water deliveries are only partially reduced because increasing pumping by the full amount alters the water budget so significantly that it causes numerical problems for the model. The run described in Appendix G (Liu and Zhan, 2016) that increases pumping from 1970-2015 also encounters numerical problems by the end of 2013 so District staff revised the run to only increase pumping for 2005-2015. Figure 42 shows the groundwater level difference between baseline Scenario 1 and Scenario 2 at the end of 2015. This figure shows that eleven years of treated water deliveries increased groundwater levels throughout the Unconsolidated Alluvium of the Santa Clara Plain, ranging from 1.9 feet to 97 feet.

9.2.3 Reduced Managed Aquifer Recharge

Scenario 5 eliminates all District managed recharge from 2005-2015. Figure 43 shows the groundwater level difference between baseline Scenario 1 and Scenario 5 at the end of 2015. This figure shows that eleven years of managed recharge increased groundwater levels throughout the Unconsolidated Alluvium of the Santa Clara Plain, ranging from 3.9 feet to 124 feet. The increases are distributed differently than increases from treated water (Figure 42) with the highest increases where creeks pass through unconfined areas.

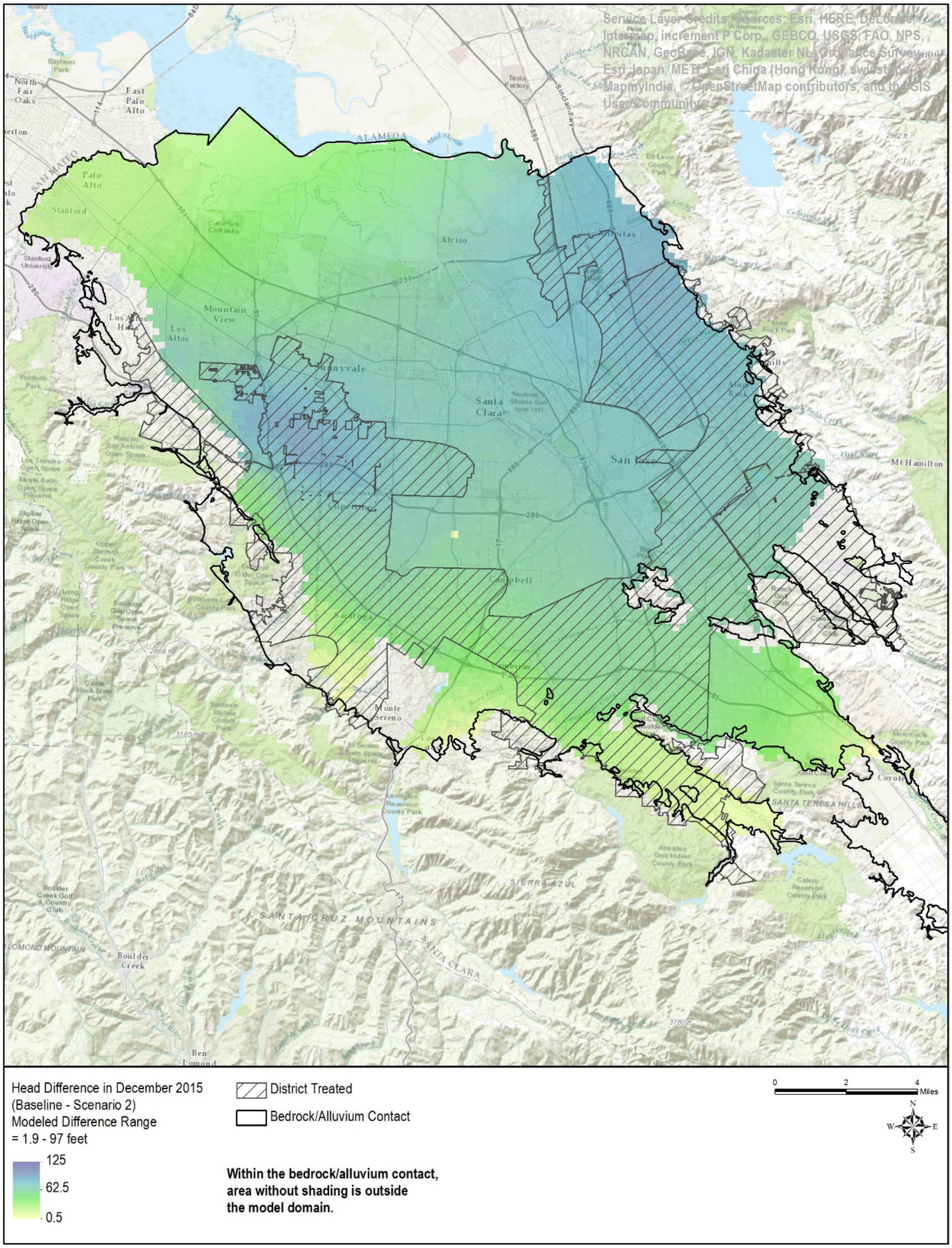

Head Difference in December 2015
(Baseline - Scenario 2)
Modeled Difference Range
= 1.9 - 97 feet
125
62.5
0.5
▨ District Treated
☐ Bedrock/Alluvium Contact
Within the bedrock/alluvium contact, area without shading is outside the model domain.
0
2
4
Miles
N
W
E
S
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Palo Alto
East Palo Alto
Stanford
Mountain View
Los Altos
Los Altos Hills
Sunnyvale
Alviso
Milpitas
Santa Clara
San Jose
Cupertino
Campbell
Saratoga
Monte Sereno
Coyote
Mt Hamilton
SANTA CRUZ MOUNTAINS
SIERRA AZUL
SANTA TERESA HILLS

Figure 42. Simulated Groundwater Difference due to Reduced Treated Water Deliveries in Santa Clara Plain

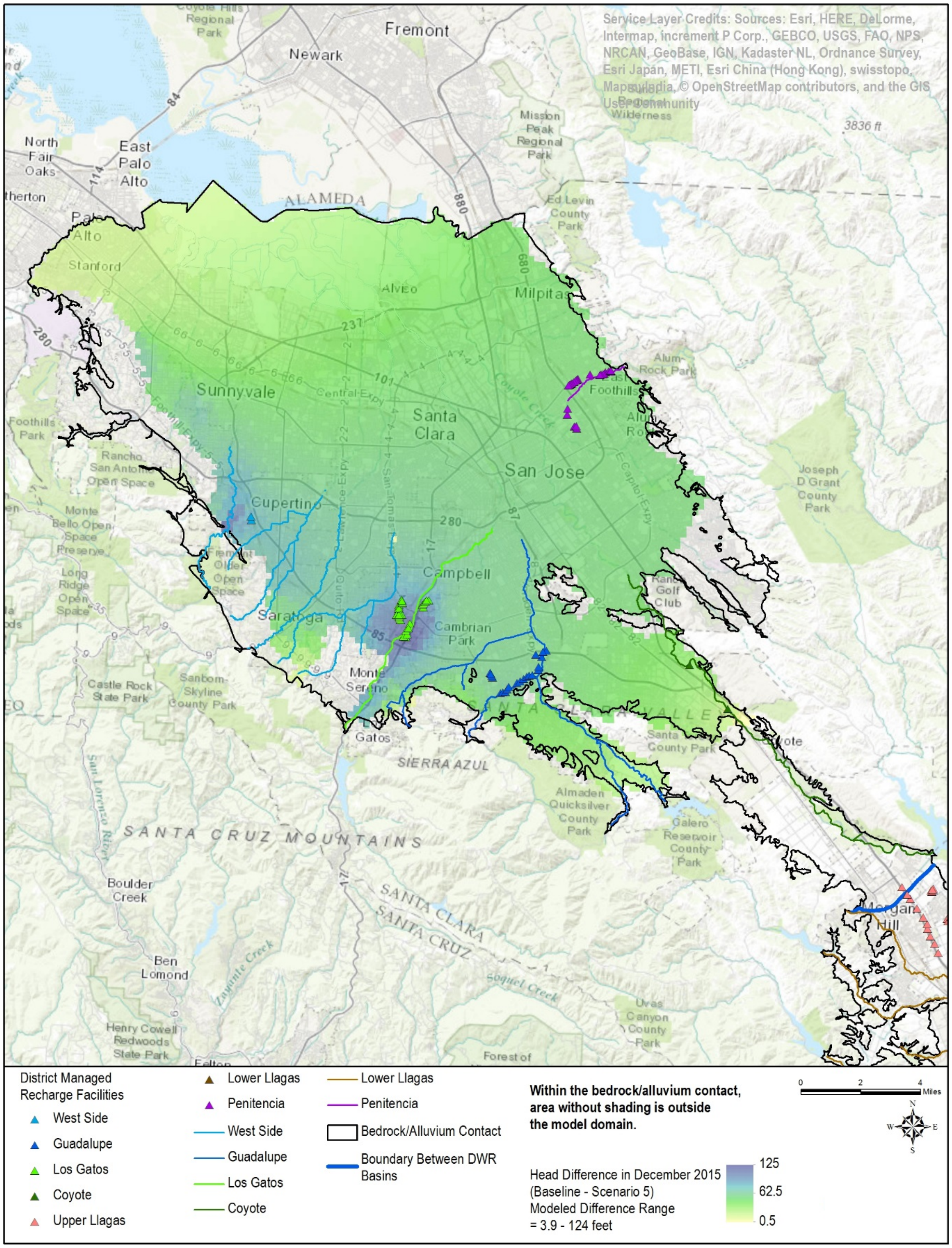

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapmyindia, © OpenStreetMap contributors, and the GIS User Community
Fremont
Newark
Coyote Hills Regional Park
North Fair Oaks
East Palo Alto
Atherton
Palo Alto
Stanford
ALAMEDA
Mission Peak Regional Park
Ed Levin County Park
3836 ft
Alviso
Milpitas
Sunnyvale
Santa Clara
San Jose
Alum Rock Park
East Foothills
Foothills Park
Rancho San Antonio Open Space
Cupertino
Monte Bello Open Space Preserve
Long Ridge Open Space
Fremont Older Open Space
Campbell
Saratoga
Cambrian Park
Monte Sereno
Los Gatos
Joseph D Grant County Park
Ranch Golf Club
SANTA CLARA VALLEY
Santa Teresa County Park
Coyote
SIERRA AZUL
Almaden Quicksilver County Park
Calero Reservoir County Park
Castle Rock State Park
Sanborn-Skyline County Park
SANTA CRUZ MOUNTAINS
Boulder Creek
Ben Lomond
Henry Cowell Redwoods State Park
Felton
Forest of Nisene Marks
Uvas Canyon County Park
Morgan Hill
SANTA CLARA
SANTA CRUZ
San Lorenzo River
Zayante Creek
Soquel Creek
District Managed Recharge Facilities
▲ West Side
▲ Guadalupe
▲ Los Gatos
▲ Coyote
▲ Upper Llagas
▲ Lower Llagas
▲ Penitencia
West Side
Guadalupe
Los Gatos
Coyote
Lower Llagas
Penitencia
Bedrock/Alluvium Contact
Boundary Between DWR Basins
Within the bedrock/alluvium contact, area without shading is outside the model domain.
Head Difference in December 2015 (Baseline - Scenario 5)
Modeled Difference Range = 3.9 - 124 feet
125
62.5
0.5
0 2 4 Miles
N
S
E
W

Figure 43. Simulated Groundwater Difference due to Reduced Managed Recharge in Santa Clara Plain

9.2.4 Reduced Recycled Water

Scenario 6 simulates reduced recycled water deliveries by assuming a reduction in these deliveries would be made up for with increased pumping. The model simulates this by increasing pumping by the recycled water delivery quantities. Pumping was increased at selected retailer wells in the area of the Palo Alto, Sunnyvale, and South Bay Water Recycling areas. Figure 44 shows the groundwater level difference between the baseline Scenario 1 and Scenario 6 with groundwater level increases due to recycled water deliveries throughout the Unconsolidated Alluvium of the Santa Clara Plain, ranging from 0.6 feet to 41 feet.

The figure shows groundwater level differences throughout the Santa Clara Plain are much smaller than differences for the reduced treated water (Scenario 2) and reduced managed recharge (Scenario 5) due to the smaller volume of recycled water delivered. This confirms that District in-lieu recharge activities such as recycled water and untreated surface water with relatively small deliveries have benefits throughout the Unconsolidated Alluvium, but benefits will be difficult to demonstrate with groundwater level data.

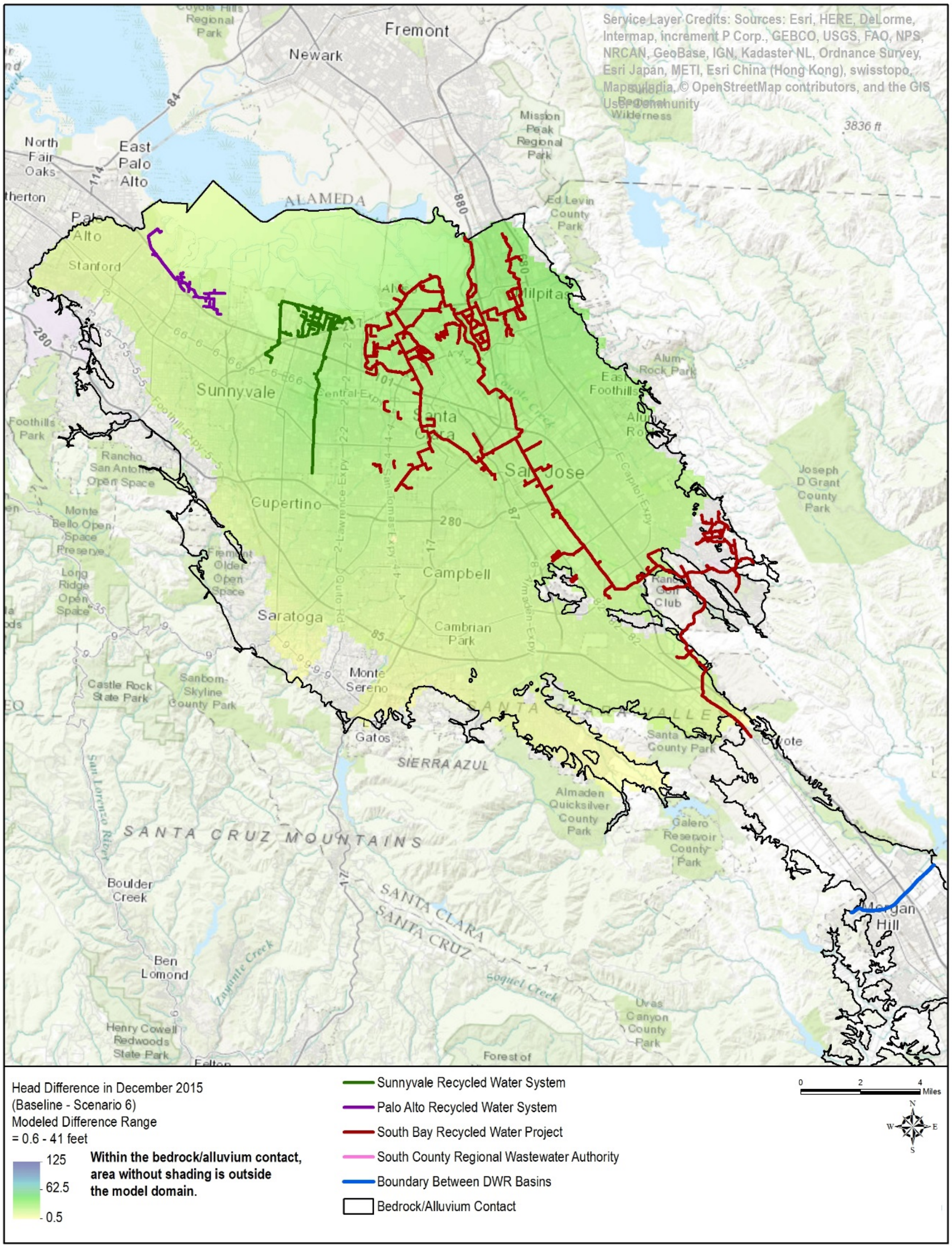

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, Mapmyindia, © OpenStreetMap contributors, and the GIS User Community
Fremont
Newark
East Palo Alto
Palo Alto
Stanford
Milpitas
Sunnyvale
Santa Clara
San Jose
Cupertino
Campbell
Saratoga
Los Gatos
Monte Sereno
Cambrian Park
Morgan Hill
SANTA CRUZ MOUNTAINS
SIERRA AZUL
Head Difference in December 2015
(Baseline - Scenario 6)
Modeled Difference Range
= 0.6 - 41 feet
125
62.5
0.5
Within the bedrock/alluvium contact, area without shading is outside the model domain.
Sunnyvale Recycled Water System
Palo Alto Recycled Water System
South Bay Recycled Water Project
South County Regional Wastewater Authority
Boundary Between DWR Basins
Bedrock/Alluvium Contact
0
2
4
Miles
N
W
E
S

Figure 44. Simulated Groundwater Level Difference due to Reduced Recycled Water in Santa Clara Plain

9.3 Santa Clara Plain Model Results Compared to the Groundwater Level Evaluation

The Santa Clara Plain model results demonstrate how benefits from individual District activities propagate throughout the hydrogeologically connected area of the Unconsolidated Alluvium of the Santa Clara Plain. The model results confirm and supplement demonstration of benefits by the groundwater level evaluation.

9.3.1 Santa Clara Plain Model Results where Groundwater Level Trends Do Not Fully Demonstrate Benefits

The model provides supplemental information in several areas where measured groundwater level trends do not fully demonstrate benefits from one or both District activities of managed recharge and treated water deliveries. These include portions of the service areas of Mountain View, Santa Clara, San Jose Water Company, Palo Alto, and Stanford.

In most of these areas, groundwater level trends for evaluation of managed recharge or treated water only demonstrate benefits during overlapping evaluation periods when benefits from the two activities cannot be distinguished. While the groundwater level trend evaluation demonstrates benefit from a District activity, the groundwater model scenarios can demonstrate benefit from each specific District activity. In these areas, the groundwater level trend evaluation only demonstrates that the area should be in a benefit zone while the model scenarios can attribute specific District activities to the zone.

Several areas in Mountain View, Santa Clara, and San Jose Water Company North have increasing groundwater level trends for evaluation of managed recharge or treated water only during overlapping evaluation periods when benefits from the two activities cannot be distinguished. There is also an area of Santa Clara where there are no groundwater data during periods to evaluate benefits from treated water deliveries. The modeled groundwater level differences between the baseline (Scenario 1) and both the reduced treated water delivery (Scenario 2) and the reduced managed recharge (Scenario 5) show the benefit in these areas are similar to surrounding areas. Therefore, the conclusion that evaluations of groundwater level trends in surrounding areas demonstrating benefit from both activities could be extrapolated to these areas is confirmed.

In the Palo Alto and Stanford areas, the groundwater level data evaluation is not able to distinguish benefits between the treated water and managed aquifer recharge activities. The modeled groundwater level differences between the baseline (Scenario 1) and both the reduced treated water delivery (Scenario 2) and the reduced managed recharge (Scenario 5) show similar benefits to the Palo Alto and Stanford areas, which demonstrates that this area benefits from both District activities.

In the San Jose Water Company Los Gatos area, measured groundwater level trends associated with treated water deliveries are stable only in an evaluation period that overlaps with managed recharge, making it difficult to definitively demonstrate the benefit from treated water deliveries. The modeled groundwater level differences between the baseline (Scenario 1) and the reduced treated water delivery (Scenario 2) in this area are similar to model results in other areas where groundwater level trends demonstrates benefit from treated water deliveries, which shows that this area also benefits from the treated water delivery activity.

9.3.2 Santa Clara Plain Model Results in Treated Water Delivery Areas

In-lieu recharge benefits to groundwater users are assumed to exist in areas receiving treated water delivery regardless of geology (Section 7.2). Figure 42 also demonstrates these benefits in these areas within the Unconsolidated Alluvium based on model results. The Santa Clara Plain model does not cover treated water delivery areas in the Santa Clara Formation and bedrock.

9.3.3 Areas not Covered by Santa Clara Plain Model

The Santa Clara Plain model does not include several areas where the groundwater level data evaluation does not demonstrate benefits from a District activity or groundwater level data are not available. These areas include Coyote Valley and the Santa Clara Formation on the west side of the subbasin.

In the Coyote Valley, groundwater level trends do not demonstrate a benefit from treated water deliveries. The Santa Clara Plain model boundary is at Coyote Narrows at the north end of Coyote Valley. Therefore, the model does not provide any information on the Coyote Valley. The groundwater level trend evaluation does demonstrate a benefit from managed recharge that occurs in this area.

Groundwater level data are not available in the Santa Clara Formation, including areas of Stanford, Purissima Hills, Palo Alto, Los Altos, Saratoga, and Los Gatos. The Santa Clara Plain model does not extend to include the Santa Clara Formation, and therefore does not provide any information showing benefits extend from the Unconsolidated Alluvium into Santa Clara Formation. The model sets a mountain front recharge boundary condition at the boundary of the Santa Clara Formation and the Unconsolidated Alluvium that represents natural recharge based on climatic conditions. The boundary condition does not account for operations of District managed recharge and therefore the District does not have an operational assumption that managed recharge is occurring in the Santa Clara Formation. However, treated water deliveries do extend into areas of the Santa Clara Formation. The groundwater model is unable to demonstrate the extent of benefits from these treated water deliveries into the rest of the Santa Clara Formation since it is outside the model area. The Santa Clara Plain model also does not simulate flow in bedrock areas and therefore is unable to demonstrate benefits extending from District activities in bedrock.

The Santa Clara Plain model also does not include the Evergreen area of San Jose Municipal Water, but the groundwater level data evaluation demonstrated benefits from managed recharge for that area. The District delivers treated water to that area, so the area also benefits from that District activity.

9.4 Llagas Model Simulations

The District ran simulations using the Llagas Subbasin groundwater model following the approach outlined above. One of the main assumptions implemented in this model is that the domain covers the Unconsolidated Alluvium east of bedrock outcrops but does not cover most of the Uvas-Chesbro area. The District memo (Abuye, 2016) included as Appendix I documents these models. The Study uses modeling that evaluates managed recharge of local runoff (Scenario 1), managed recharge of imported water (Scenario 2), and recycled water deliveries (Scenario 4) separately. The Study does not use Scenario 3 evaluating effects of all managed recharge because recharge of local runoff and imported water are evaluated separately to account for the fact that the lower Llagas system is not connected to imported water. All runs simulate historical conditions for climate from 1987-2015.

9.4.1 Baseline

The baseline run simulates historical conditions from 1987-2015 for pumping and managed recharge. Results from all other scenarios are compared to this scenario to evaluate the extent of benefit from a specific District activity. This comparison is done by subtracting groundwater level results at the end of each of Scenarios 1, 2 and 4 from the results at the end of this baseline run (Figure 45 through Figure 47). A positive difference in the groundwater levels indicate a benefit from the District activity because the baseline run includes the District activity as fully implemented historically. The Study evaluates each map of the groundwater level difference in 2015 for demonstrated extent of benefits. Yellow represents the minimum groundwater level difference of 0.5 feet across all scenarios when compared to the baseline scenario. Dark blue represents the maximum groundwater level difference of 303 feet across all scenarios when compared to the baseline scenario.

9.4.2 Reduced Managed Aquifer Recharge of Local Runoff

Scenario 1 eliminates managed recharge of local runoff at the Upper Llagas and Lower Llagas systems from 2005-2015. Figure 45 shows the groundwater level difference between the Baseline scenario and Scenario 1. This figure shows managed recharge of local water resulted in increases in groundwater levels throughout the modeled domain of the Llagas Subbasin ranging from 25 to 303 feet. Since the model domain does not include the Uvas Chesbro area, the model does not simulate the managed recharge of local runoff that occurs in Uvas and Llagas Creeks in that area.

9.4.3 Reduced Managed Aquifer Recharge of Imported Water Runoff

Scenario 2 eliminates managed recharge of imported water at the Upper Llagas system from 2005-2015. Figure 46 shows the groundwater level difference between the Baseline scenario and Scenario 2. This figure shows increases in groundwater levels from eleven years of managed recharge of local runoff throughout the modeled domain of the Llagas Subbasin ranging from 0.9 to 108 feet.

9.4.4 Reduced Recycled Water

Scenario 4 simulates reduced recycled water deliveries by assuming a reduction in these deliveries would be made up for with increased pumping. This was accomplished in the model by increasing pumping by the recycled water delivery quantities to decrease in-lieu recharge from recycled water deliveries. Increased pumping is distributed between 58 pumping wells with 0.5 mile of the South County Regional Wastewater Authority recycled water pipeline. Figure 47 shows the groundwater level difference between the Baseline scenario and Scenario 4. This figure shows increases in groundwater levels from recycled water deliveries throughout the modeled domain of the Llagas Subbasin ranging from 0.5 to 11 feet. However, groundwater level differences throughout the subbasin are much smaller than differences for the eliminated managed recharge of local runoff (Scenario 1) and eliminated managed recharge of imported water (Scenario 2) due to the smaller volume of recycled water delivered. This confirms that District in-lieu recharge activities with relatively small deliveries, such as recycled water and untreated surface water, have benefits throughout the hydrogeologically connected area. However, benefits will be difficult to demonstrate with groundwater level data.

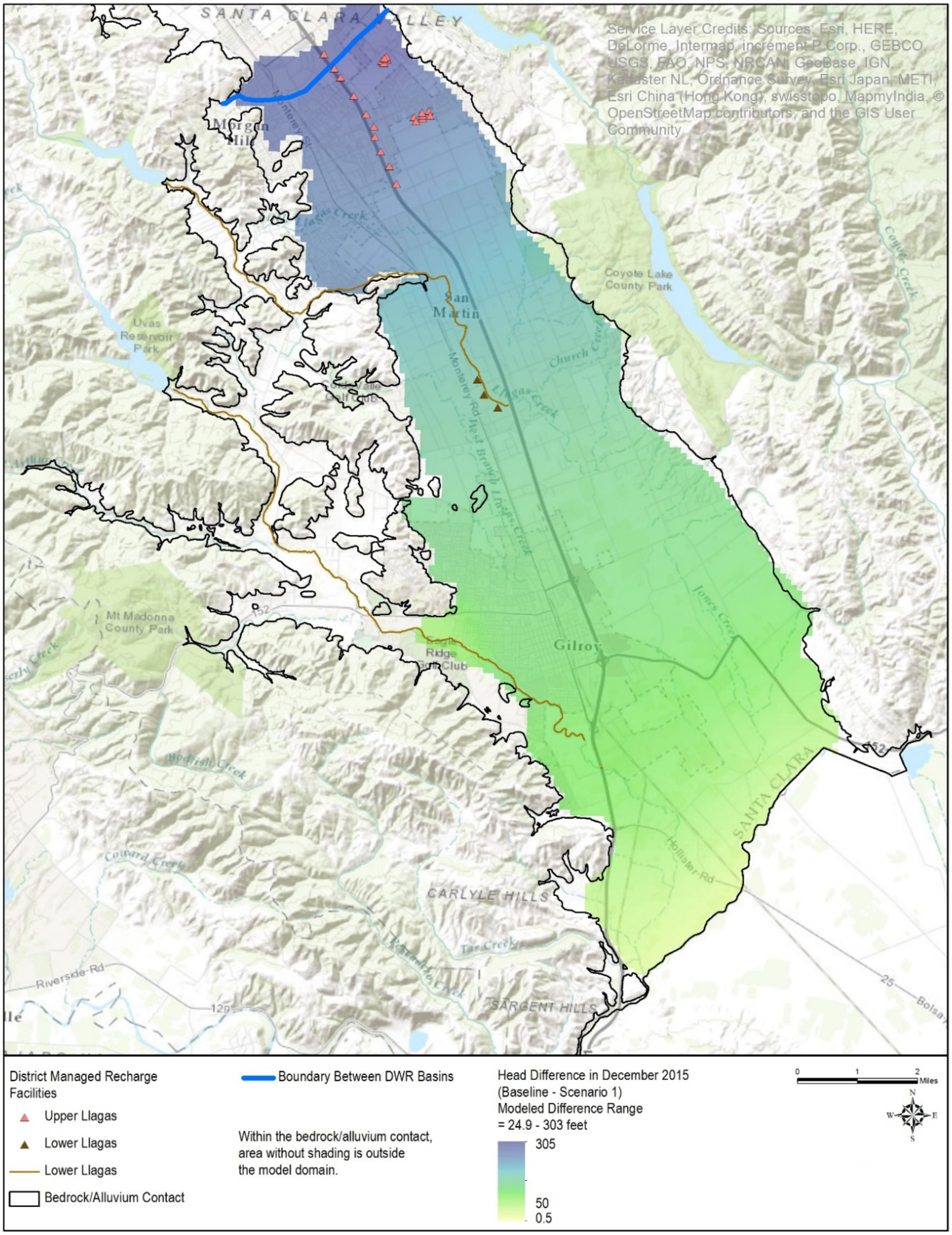


Figure 45. Simulated Groundwater Level Difference due to Reduced Managed Recharge of Local Runoff in Llagas Subbasin

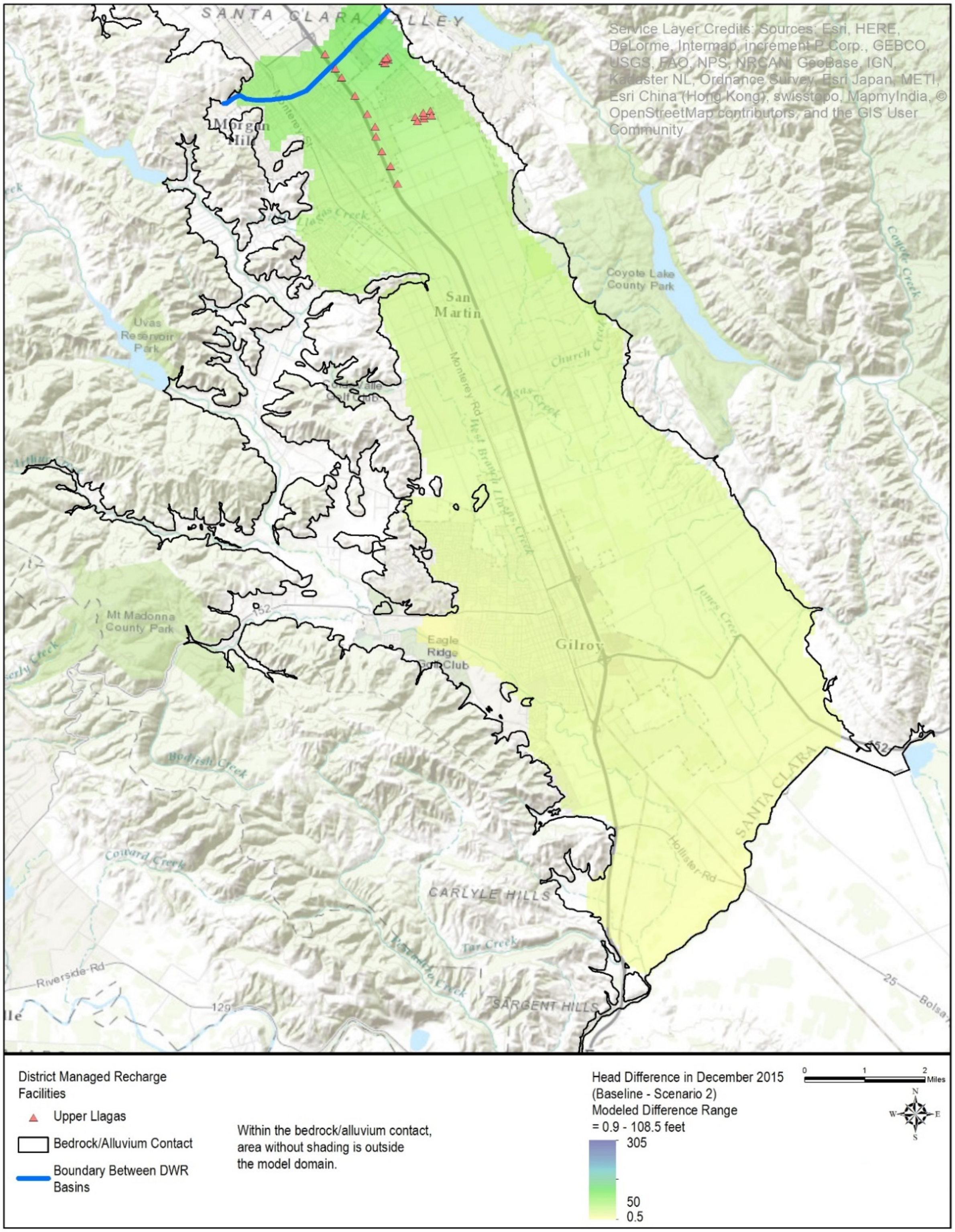

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Figure 46. Simulated Groundwater Level Difference due to Reduced Managed Recharge of Imported Water in Llagas Subbasin

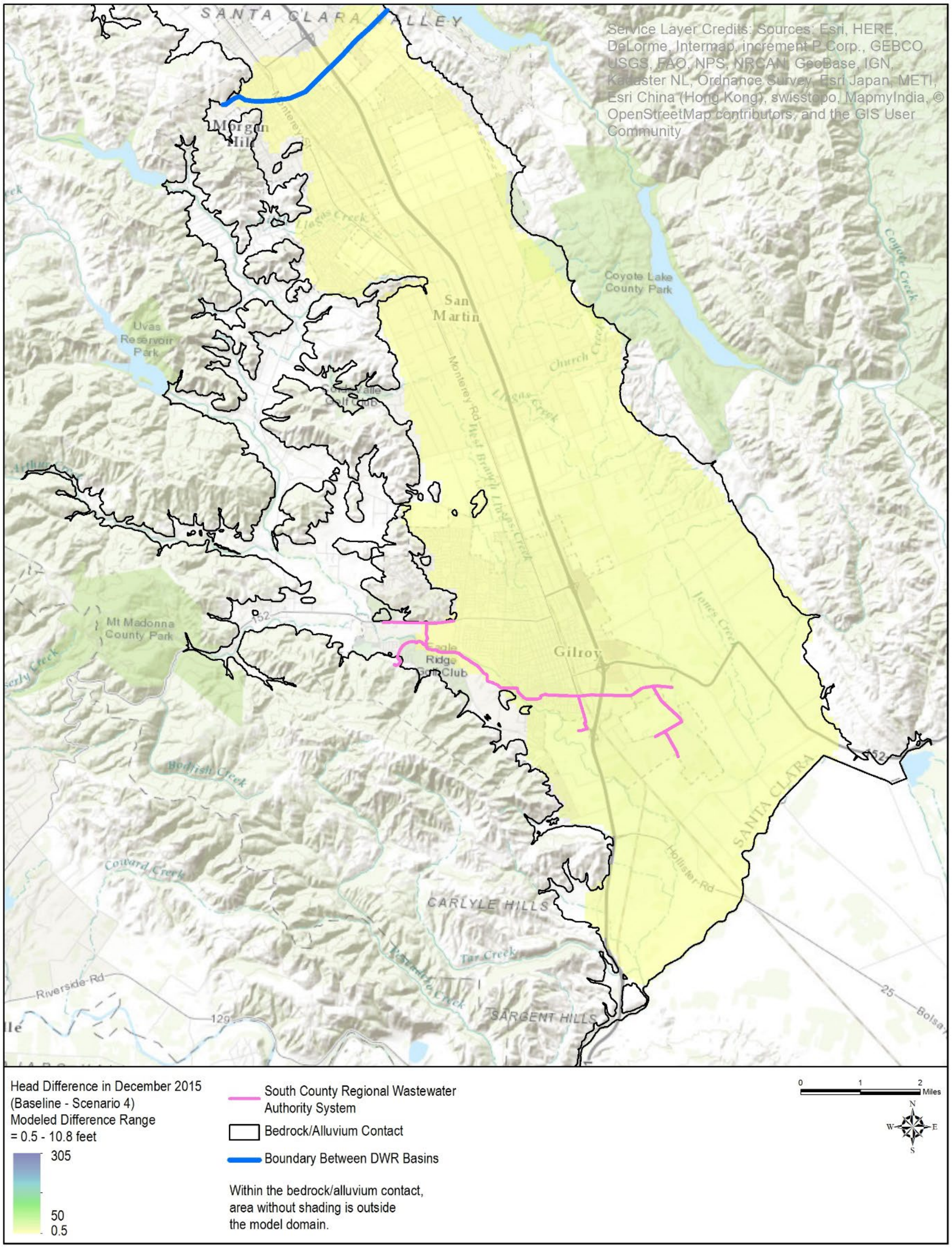

SANTA CLARA VALLEY
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Morgan Hill
Llagas Creek
Coyote Lake County Park
Coyote Creek
San Martin
Uvas Reservoir Park
Church Creek
Monterey Rd
West Branch Llagas Creek
Mt Madonna County Park
152
Eagle Ridge Golf Club
Gilroy
Jones Creek
Bodfish Creek
SANTA CLARA
Hollister Rd
Coward Creek
CARLYLE HILLS
Tar Creek
Riverside Rd
SARGENT HILLS
25
Bolsa
129
Head Difference in December 2015
(Baseline - Scenario 4)
Modeled Difference Range
= 0.5 - 10.8 feet
305
50
0.5
South County Regional Wastewater Authority System
Bedrock/Alluvium Contact
Boundary Between DWR Basins
Within the bedrock/alluvium contact, area without shading is outside the model domain.
0
1
2
Miles
N
W
E
S

Figure 47. Simulated Groundwater Level Difference due to Reduced Recycled Water in Llagas Subbasin

9.5 Llagas Model Results Compared to Groundwater Level Evaluation

While the groundwater evaluation evaluates managed recharge of local runoff and imported water together, the model results demonstrate how benefits from managed recharge of local runoff and imported water propagate throughout the hydrogeologically connected area of the subbasin. The model results supplement demonstration of benefits in pumping areas by the groundwater level evaluation.

9.5.1 Area not Covered by Llagas Model

The model does not the cover the Uvas-Chesbro area where the groundwater level data evaluation does not demonstrate benefits from a District activity or groundwater level data are not available. The model only simulates the area east of the bedrock outcrops in the Llagas Subbasin that separates the Uvas-Chesbro area from the rest of the basin. Therefore, the model does not provide any information showing that benefits extend from managed recharge of imported water occurring east of the bedrock outcrops to the Uvas-Chesbro area. Managed recharge of local water occurs in the Uvas-Chesbro area and is assumed to benefit the hydrogeologically connected Unconsolidated Alluvium in that area. The Llagas model also does not simulate flow in bedrock areas and therefore is unable to demonstrate benefits extending from District activities in bedrock.

10 GROUNDWATER BENEFIT ZONES

We conclude the following from the Study evaluation to guide proposed groundwater benefit zones.

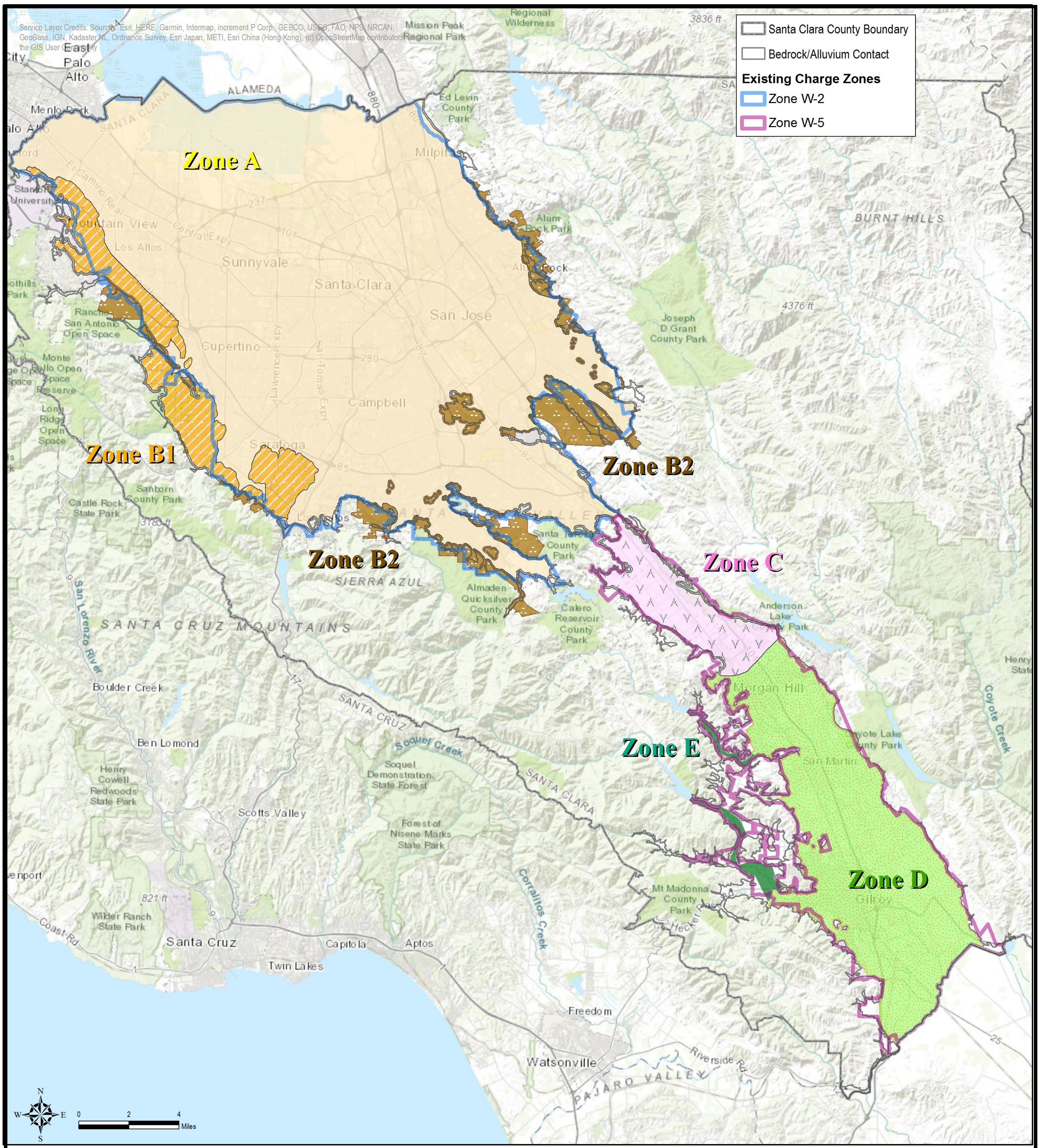
1. District recharge activities are located in alluvium that provides hydrogeologic connection throughout the Santa Clara and Llagas Subbasins.
2. District recharge activities have improved the water balance in hydrogeologically connected areas over time.
3. Groundwater level data and numerical groundwater modeling results demonstrate that benefits from District activities extend throughout hydrogeologically connected areas of Unconsolidated Alluvium where the District activities are located.
4. The groundwater level data do not conclusively demonstrate that benefits of District treated water deliveries in the Santa Clara Plain extend south into Coyote Valley as Coyote Narrows may restrict groundwater flow between the two management areas.
5. Groundwater level data and modeling results are not available to evaluate whether benefits from District activities in the Unconsolidated Alluvium of the Santa Clara Plain extend into the Santa Clara Formation located on the west side of the Santa Clara Plain.
6. District treated water delivery reduces groundwater demand in the Santa Clara Formation thereby improving the groundwater supply. It is reasonable to conclude that the Santa Clara Formation consists of hydrogeologically connected alluvium so District in-lieu recharge activities in the Santa Clara Formation benefit connected areas of the Santa Clara Formation. However, the uncertainty of this conclusion is higher than a similar conclusion for the Unconsolidated Alluvium due to lack of groundwater level data and numerical groundwater modeling.
7. Groundwater level data are not available to evaluate whether benefits from District activities in alluvium (Unconsolidated Alluvium or Santa Clara Formation) extend into bedrock. However, bedrock areas receiving District treated water supplies benefit from in-lieu recharge to those areas that reduce groundwater pumping from bedrock fractures even though there is a lack of groundwater level data and numerical groundwater modeling for these areas. However, bedrock fractures may be limited in areal extent, so the benefit is not considered to extend beyond the bedrock areas receiving District treated water.
8. Groundwater level data and modeling results are not available to demonstrate that managed recharge of imported water in the Llagas Subbasin valley floor benefits the narrow alluvium along Llagas and Uvas Creeks downstream of District reservoirs and upstream of the valley floor. However, the alluvium along these creeks does benefit from District releases of local runoff for managed recharge.
9. Recycled water and untreated surface water deliveries are too small relative to other District activities to evaluate benefits with groundwater level data. Modeling results of

in-lieu recharge from recycled water demonstrate that benefits from these small activities have benefits throughout hydrogeologically connected areas.

Based on these conclusions, the boundaries used to define the proposed zones are as follows:

1. Bedrock/Alluvium contact
2. DWR basin boundary approximating groundwater divide between Santa Clara and Llagas Subbasins.
3. Coyote Narrows between Santa Clara Plain and Coyote Valley.
4. Santa Clara Formation outcrops.
5. Retailer areas where District treated water is delivered
6. Narrows between bedrock outcrops in Llagas Subbasin
7. Western boundaries of Morgan Hill and Gilroy.
8. Constrictions where alluvial channels are upstream of areas hydrogeologically connected to District activities.

Figure 48 presents the proposed groundwater benefit zones.



These mapped zones may be revised further to account for administrative requirements. These zones will also require additional revision to facilitate the development of legal descriptions for the zones. This will involve approximating the boundaries to reduce the number of line segments that require a metes and bounds description.

Zone A: Benefits from Managed Aquifer Recharge, Treated Water Deliveries, and Recycled Water Programs in the Santa Clara Plain

Zone A consists of areas overlying Unconsolidated Alluvium, and benefits from District treated water deliveries, managed aquifer recharge using local runoff and imported water, and recycled water programs. Zone A excludes areas of mapped Santa Clara Formation where benefits from managed aquifer recharge activities are not evaluated due to limited well data. The northern boundary is the San Mateo-Santa Clara County line and the southern boundary is the boundary between existing Zones W-2 and W-5.

Zone B1: Benefits from Treated Water Deliveries in the Santa Clara Formation

Zone B1 consists of areas within the Santa Clara Formation that are hydrogeologically connected to areas where District treated water is delivered. Data are not available to demonstrate benefits from the District's managed aquifer recharge. Foothill Expressway is used to approximate the eastern extent of the Santa Clara Formation underlying the alluvial outcrop. In addition to approximating this geological boundary, this also lines up with the District treated water delivery area for the Cal Water Los Altos service area; the treated water delivery provides in-lieu benefits for this area of the zone.

Zone B2: Benefits from Treated Water Deliveries in Bedrock

Zone B2 consists of areas with underlying bedrock where District treated water is delivered. Bedrock areas outside the treated water delivery areas are excluded from this and other zones because bedrock fractures with accessible groundwater may be limited in areal extent. Therefore, the benefit is not considered to extend beyond the treated water delivery area. Zone B2 includes many separate areas where bedrock underlies District treated water delivery areas.

All zones benefit from long-term water conservation and groundwater protection activities

Zone C: Benefits from Managed Aquifer Recharge in Coyote Valley

Zone C consists of Unconsolidated Alluvium in the Coyote Valley where benefits from managed aquifer recharge using both local runoff and imported water are demonstrated. The northern boundary is the boundary between existing Zones W-2 and W-5. The southern boundary is the boundary between the California Department of Water Resources (DWR) Santa Clara and Llagas subbasins that approximates the groundwater divide separating the two basins.

Zone D: Benefits from Managed Aquifer Recharge (Local Runoff and Imported Water) and Recycled Water Programs in the Llagas Subbasin

This zone consists of areas overlying Unconsolidated Alluvium in the Llagas Subbasin where benefits from managed aquifer recharge of imported and local water are demonstrated. The zone contains the entire retail service areas of the cities of Morgan Hill and Gilroy. The northern boundary is the boundary between the Santa Clara and Llagas subbasins as defined by DWR. The southern boundary is based on the Santa Clara-San Benito County line corresponding with the southern extent of Unconsolidated

Zone E: Benefits from Managed Aquifer Recharge of Local Runoff in Uvas/Llagas Creek Bottoms

This zone consists of areas overlying Unconsolidated Alluvium along upper Uvas and Llagas creeks where District managed aquifer recharge of local runoff occurs. This includes Unconsolidated Alluvium west of the cities of Morgan Hill and Gilroy that are deposited along Llagas Creek and Uvas Creek below the District's Chesbro and Uvas Reservoirs. These narrow alluvial channels are surrounded by bedrock outcrops and are upstream of the main valley floor. The boundary between proposed Zones D and E is based upon the location where data and groundwater model results are available to demonstrate benefit from imported water. Alluvial channels for tributaries that are not directly downstream of the District's reservoirs are excluded from this zone.

H:\Santa Clara VWD\Groundwater_Charge_Zone_Study\GIS\FINAL_MXD_FILES\zoneMAPS\ZOB_figures\3_Draft_Zones_of_Benefit.mxd

Figure 48. Proposed Groundwater Benefit Zones

10.1 Zone A Benefits from Managed Aquifer Recharge, Treated Water Deliveries, and Recycled Water in the Santa Clara Plain

Zone A consists of areas overlying Unconsolidated Alluvium, and benefits from District treated water deliveries, managed aquifer recharge using local runoff and imported water, and recycled water programs. Zone A excludes areas of mapped Santa Clara Formation where benefits from managed aquifer recharge activities are not evaluated due to limited well data. The northern boundary is the San Mateo-Santa Clara County line and the southern boundary is the boundary between existing Zones W-2 and W-5.

10.2 Zone B1 Benefits from Treated Water Deliveries in the Santa Clara Formation

Zone B1 consists of areas within the Santa Clara Formation that are hydrogeologically connected to areas where District treated water is delivered (Figure 49). Data are not available to demonstrate benefits from the District's managed aquifer recharge. Foothill Expressway is used to approximate the eastern extent of the Santa Clara Formation underlying the alluvial outcrop. In addition to approximating this geological boundary, this also lines up with the District treated water delivery area for the Cal Water Los Altos service area; the treated water delivery provides in-lieu benefits for this area of the zone.

10.3 Zone B2 Benefits from Treated Water Deliveries in Bedrock

Zone B2 consists of areas with underlying bedrock where District treated water is delivered (Figure 49).. Bedrock areas outside the treated water delivery areas are excluded from this and other zones because bedrock fractures with accessible groundwater may be limited in areal extent. Therefore, the benefit is not considered to extend beyond the treated water delivery area. Zone B2 includes many separate areas where bedrock underlies District treated water delivery areas.

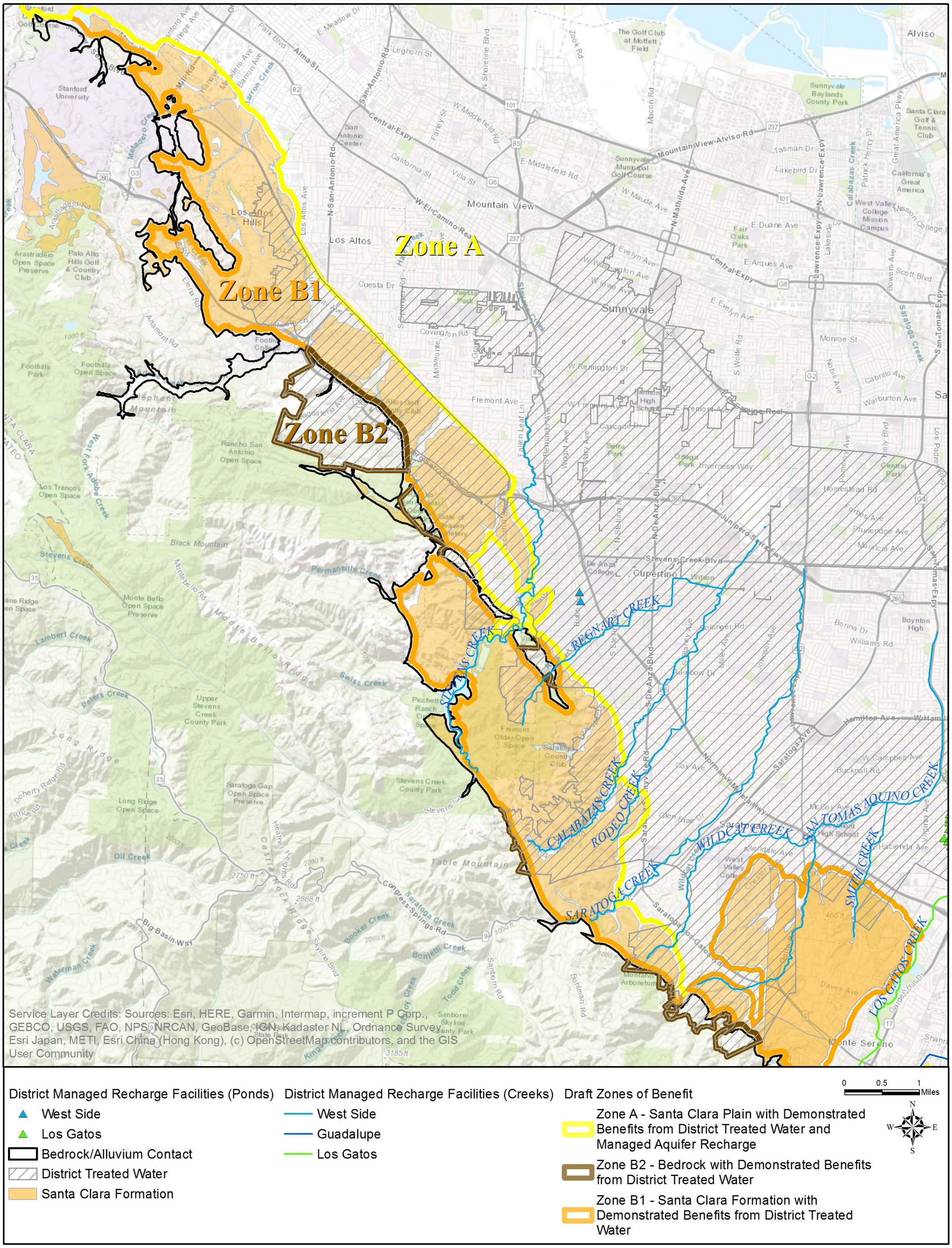

Zone A
Zone B1
Zone B2
Stanford University
Los Altos Hills
Los Altos
Mountain View
Sunnyvale
Cupertino
Alviso
The Golf Club at Moffett Field
Sunnyvale Baylands County Park
Arastradero Open Space Preserve
Palo Alto Hills Golf & Country Club
Foothills Park
Foothills Open Space
Rancho San Antonio Open Space
Los Trancos Open Space
Black Mountain
Monte Bello Open Space Preserve
Upper Stevens Creek County Park
Stevens Creek County Park
Saratoga Gap Open Space Preserve
Long Ridge Open Space
Fremont Older Open Space
Saratoga Country Club
Picchetti Ranch
Table Mountain
Montalvo Arboretum
Sanborn-Skyline County Park
De Anza College
West Valley College
Monte Sereno
STEVENS CREEK
REGNART CREEK
CALABAZAS CREEK
RODEO CREEK
SARATOGA CREEK
WILDCAT CREEK
SAN TOMAS AQUINO CREEK
SMITH CREEK
LOS GATOS CREEK
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
District Managed Recharge Facilities (Ponds)
▲ West Side
▲ Los Gatos
Bedrock/Alluvium Contact
▨ District Treated Water
Santa Clara Formation
District Managed Recharge Facilities (Creeks)
West Side
Guadalupe
Los Gatos
Draft Zones of Benefit
Zone A - Santa Clara Plain with Demonstrated Benefits from District Treated Water and Managed Aquifer Recharge
Zone B2 - Bedrock with Demonstrated Benefits from District Treated Water
Zone B1 - Santa Clara Formation with Demonstrated Benefits from District Treated Water
0
0.5
1
Miles
N
S
E
W

Figure 49. Zones A and B in Santa Clara Formation on Westside of Santa Clara Subbasin

10.4 Zone C Benefits from Managed Aquifer Recharge in Coyote Valley

Zone C consists of Unconsolidated Alluvium in the Coyote Valley where benefits from managed aquifer recharge using both local runoff and imported water are demonstrated. The northern boundary is the boundary between existing Zones W-2 and W-5. The southern boundary is the boundary between the California Department of Water Resources (DWR) Santa Clara and Llagas Subbasins that approximates the groundwater divide separating the two basins.

10.5 Zone D Benefits from Managed Aquifer Recharge (Local Runoff and Imported Water) and Recycled Water in the Llagas Subbasin

Zone D consists of areas overlying Unconsolidated Alluvium in the Llagas Subbasin where benefits from managed aquifer recharge of imported and local water are demonstrated. The zone contains the entire retail service areas of the cities of Morgan Hill and Gilroy because groundwater pumped from areas where benefits are demonstrated are delivered to these hydrogeologically connected areas within Morgan Hill and Gilroy. The northern boundary is the boundary between the Santa Clara and Llagas Subbasins as defined by DWR. The southern boundary is based on the Santa Clara-San Benito County line corresponding with the southern extent of Unconsolidated Alluvium in Santa Clara County.

10.6 Zone E Llagas Benefits from Managed Aquifer Recharge of Local Runoff in Uvas/Llagas Creek

Zone E consists of areas overlying Unconsolidated Alluvium along upper Uvas and Llagas Creeks where District managed aquifer recharge of local runoff occurs. This includes Unconsolidated Alluvium west of the cities of Morgan Hill and Gilroy that are deposited along Llagas Creek and Uvas Creek below the District's Chesbro and Uvas Reservoirs. These narrow alluvial channels are surrounded by bedrock outcrops and are upstream of the main valley floor. The boundary between proposed Zones D and E is based upon the location where data and groundwater model results are available to demonstrate benefit from imported water and the boundaries of retail service areas of the cities of Morgan Hill and Gilroy. Alluvial channels for tributaries that are not directly downstream of the District's reservoirs are excluded from this zone.

10.7 Assignment of District Activities to Zones

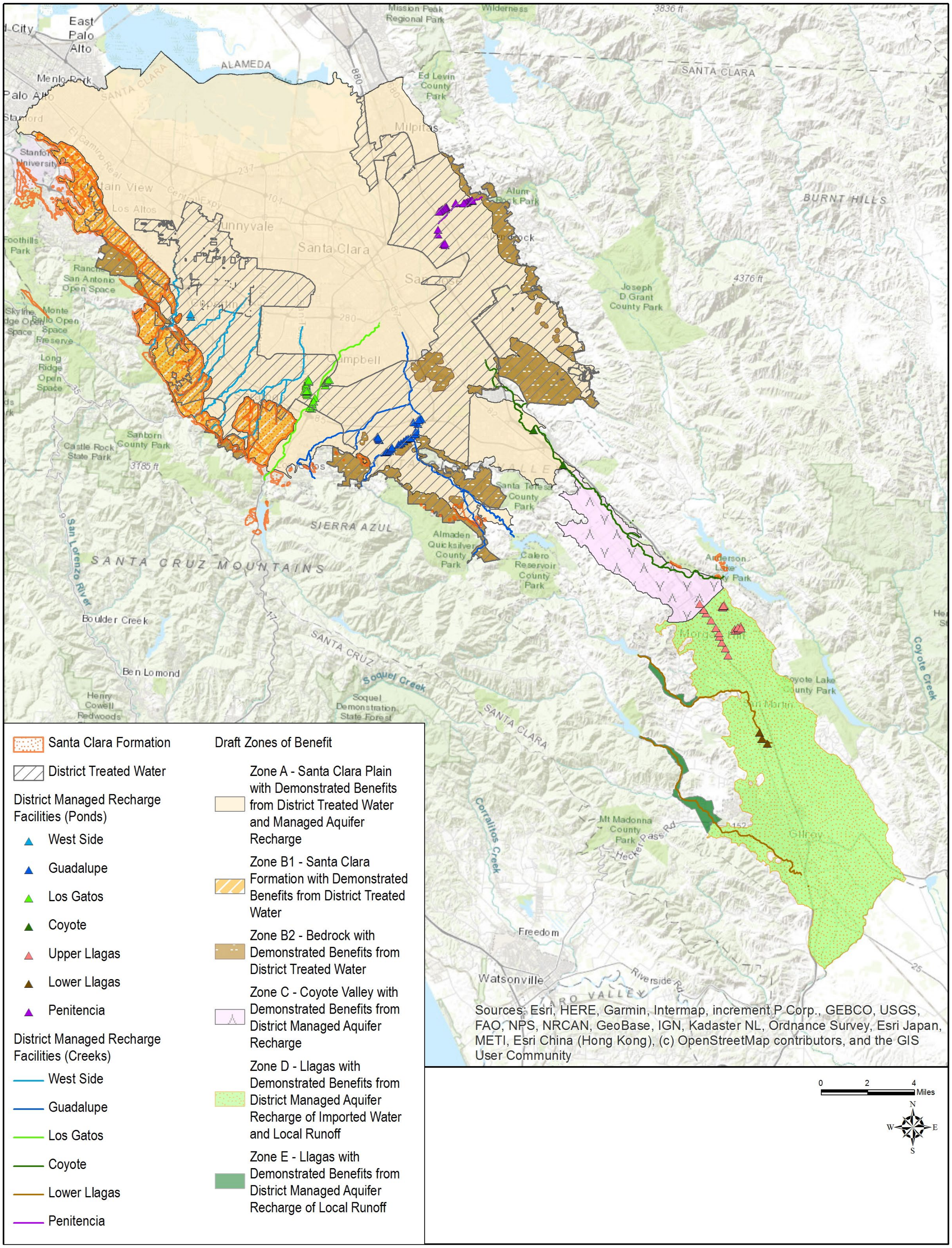
The Study proposes groundwater benefit zones primarily based on District activities of managed aquifer recharge and treated water deliveries. Figure 50 shows managed recharge facilities and treated water delivery areas overlying the proposed groundwater benefit zones.

Although the groundwater benefit zones are based on the managed aquifer recharge and treated water deliveries that provide the largest District contributions to the water budget, other District activities provide benefits to groundwater users in the zones. Activities such as recycled water and untreated surface water deliveries can be assigned to zones they are located within, as shown on Figure 51. The modeling runs for recycled water did show groundwater level increases from in-lieu recharge provided by recycled water throughout the Zone A and Zone D areas. Similarly, planned future activities can be assigned to zones where they are planned to be located such as indirect potable reuse in Zone A.

District activities such as conservation and groundwater protection benefit all groundwater users so are assigned to all groundwater benefit zones. Table 11 summarizes the assignment of District activities to the groundwater benefit zones.

Table 11. District Activity Assignment to Zones

District Activity	Zones
Managed Recharge (Local Runoff)	A, C, D, E
Managed Recharge (Imported Water)	A, C, D
Treated Water Deliveries	A, B1, B2
Recycled Water	A, D
Untreated Surface Water Deliveries	A, C, D, E
Conservation	All
Groundwater Protection	All
Planned Indirect Potable Reuse	A


Santa Clara Formation
District Treated Water
District Managed Recharge Facilities (Ponds)
West Side
Guadalupe
Los Gatos
Coyote
Upper Llagas
Lower Llagas
Penitencia
District Managed Recharge Facilities (Creeks)
West Side
Guadalupe
Los Gatos
Coyote
Lower Llagas
Penitencia
Draft Zones of Benefit
Zone A - Santa Clara Plain with Demonstrated Benefits from District Treated Water and Managed Aquifer Recharge
Zone B1 - Santa Clara Formation with Demonstrated Benefits from District Treated Water
Zone B2 - Bedrock with Demonstrated Benefits from District Treated Water
Zone C - Coyote Valley with Demonstrated Benefits from District Managed Aquifer Recharge
Zone D - Llagas with Demonstrated Benefits from District Managed Aquifer Recharge of Imported Water and Local Runoff
Zone E - Llagas with Demonstrated Benefits from District Managed Aquifer Recharge of Local Runoff
0 2 4 Miles
N
W
E
S
East Palo Alto
Menlo Park
Palo Alto
Stanford
Stanford University
Mountain View
Los Altos
Sunnyvale
Santa Clara
San Jose
Cupertino
Campbell
Los Gatos
Milpitas
ALAMEDA
SANTA CLARA
Mission Peak Regional Park
Wilderness
3836 ft
Ed Levin County Park
Alum Rock Park
BURNT HILLS
Joseph D Grant County Park
4376 ft
Foothills Park
Rancho San Antonio Open Space
Skyline Ridge Open Space
Monte Bello Open Space Preserve
Long Ridge Open Space
Sanborn County Park
Castle Rock State Park
3185 ft
SIERRA AZUL
SANTA CRUZ MOUNTAINS
San Lorenzo River
Boulder Creek
Ben Lomond
Henry Cowell Redwoods
SANTA CRUZ
Soquel Creek
Soquel Demonstration State Forest
Almaden Quicksilver County Park
Calero Reservoir County Park
Santa Teresa County Park
Anderson Lake County Park
Morgan Hill
Coyote Lake County Park
Coyote Creek
San Martin
Gilroy
Mt Madonna County Park
Hecker Pass Rd
Corralitos Creek
Freedom
Watsonville
Riverside Rd
PAJARO VALLEY

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 50: Managed Recharge Facilities and Treated Water Deliveries with Groundwater Benefit Zones

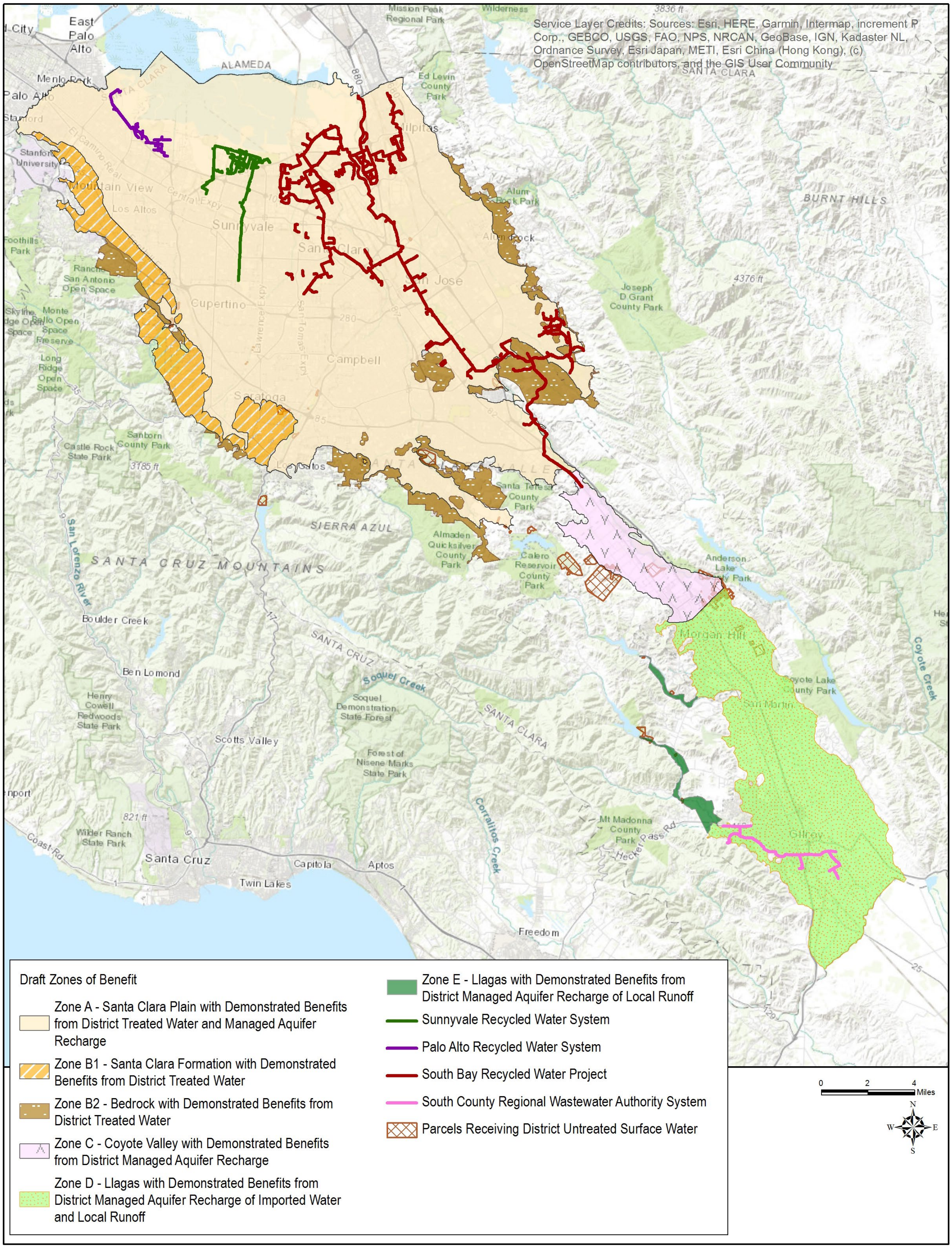

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
East Palo Alto
Menlo Park
Palo Alto
Stanford University
ALAMEDA
SANTA CLARA
Mission Peak Regional Park
Ed Levin County Park
Milpitas
Mountain View
Los Altos
Sunnyvale
Santa Clara
San Jose
Cupertino
Campbell
Saratoga
Los Gatos
Alum Rock Park
BURNT HILLS
Joseph D Grant County Park
Foothills Park
Rancho San Antonio Open Space
Monte Bello Open Space Preserve
Long Ridge Open Space
Sanborn County Park
Castle Rock State Park
SIERRA AZUL
SANTA CRUZ MOUNTAINS
Almaden Quicksilver County Park
Calero Reservoir County Park
Santa Teresa County Park
Anderson Lake County Park
Morgan Hill
San Martin
Coyote Lake County Park
Coyote Creek
Gilroy
Mt Madonna County Park
Hecker Pass Rd
San Lorenzo River
Boulder Creek
Ben Lomond
Henry Cowell Redwoods State Park
Scotts Valley
Soquel Creek
Soquel Demonstration State Forest
Forest of Nisene Marks State Park
Corralitos Creek
Wilder Ranch State Park
Santa Cruz
Capitola
Aptos
Twin Lakes
Freedom
Draft Zones of Benefit
Zone A - Santa Clara Plain with Demonstrated Benefits from District Treated Water and Managed Aquifer Recharge
Zone B1 - Santa Clara Formation with Demonstrated Benefits from District Treated Water
Zone B2 - Bedrock with Demonstrated Benefits from District Treated Water
Zone C - Coyote Valley with Demonstrated Benefits from District Managed Aquifer Recharge
Zone D - Llagas with Demonstrated Benefits from District Managed Aquifer Recharge of Imported Water and Local Runoff
Zone E - Llagas with Demonstrated Benefits from District Managed Aquifer Recharge of Local Runoff
Sunnyvale Recycled Water System
Palo Alto Recycled Water System
South Bay Recycled Water Project
South County Regional Wastewater Authority System
Parcels Receiving District Untreated Surface Water
0
2
4
Miles
N
E
S
W

Figure 51:Recycled Water Systems and Parcels Receiving Untreated Surface Water with Groundwater Benefit Zones

10.8 SUMMARY OF SUPPORTING ANALYSES FOR GROUNDWATER BENEFIT ZONES

The recommendation of groundwater benefit zones is based on several analyses. This section summarizes which analyses are used to establish assignment of benefits from District activities to each recommended zone (Table 11). The analyses include:

- Mapping of treated water delivery area. The delivery of treated water is a substantial source of in-lieu recharge to the Santa Clara Subbasin as shown in Section 6. Groundwater users in the area where treated water is delivered benefit from the in-lieu recharge to the area where groundwater pumping for the area is reduced thereby improving groundwater conditions for the area. Mapping of treated water delivery areas is described in Section 7.1 with areas occurring in zones A, B1, and B2. Mapping of recycled water distribution systems and parcels receiving surface water are not used to establish zone areas because they are not contiguous areas, but benefits from these activities occur in hydrogeologically connected zones. The only area that is recommended as part of a groundwater benefit zone solely due to mapping of treated water delivery area is zone B2.
- Groundwater level data evaluation. The groundwater level data evaluation described in Section 8 evaluates benefits from District treated water and managed recharge activities during periods when groundwater levels would be expected to decline without District activities. If groundwater levels are stable or increasing during the period, benefit from the District activity is demonstrated. In some periods, groundwater levels demonstrate a benefit from District activities, but District treated water and managed recharge activities overlap so benefits from the specific activity cannot be identified. Declining groundwater levels during evaluation periods do not indicate a lack of benefit from District activities as declining groundwater levels are expected during the period and District activities may be reducing the decline. If a benefit from a District activity is demonstrated to an area during any evaluation period, the benefit to the area is demonstrated as long as the District activity continues based on the ongoing water budget benefits from District activities. The groundwater level data evaluation supports demonstration of benefits in zones A, C, and D.
- Modeling. As described in Section 9, simulations were performed with the Santa Clara Plain and Llagas Subbasin groundwater models to evaluated benefits from treated water deliveries, managed recharge with local supplies, managed recharge with imported supplies, and recycled water separately. Model results of groundwater levels are compared between a baseline run with all District activities occurring as they have historically with runs that remove or reduce each of the District activities. This allows an evaluation of the benefits from each specific District activity separately. The model

results also supplement the groundwater level data evaluation where groundwater level trends do not fully demonstrate benefits to an area from a specific activity. Modeling supports demonstration of benefits in zones A and D.

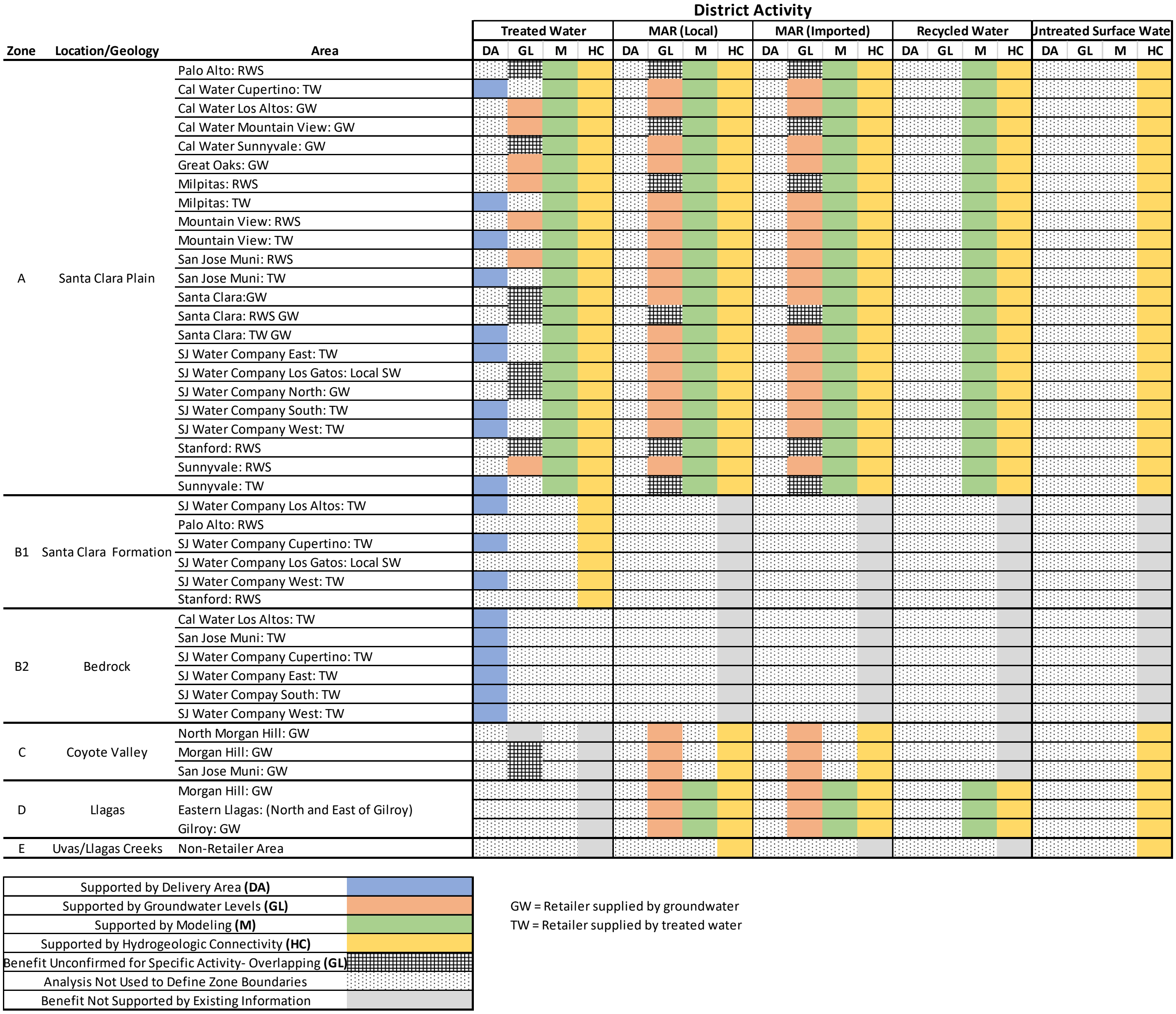
- Hydrogeologic connection. As described in Section 5, the Study maps hydrogeologic features that affect groundwater flow to define areas hydrogeologically connected to District activities that extend benefits from those activities beyond their immediate locations. Information about hydrogeologically connected areas supports inclusion of benefits in zones A, B1, C, D, and E. The only areas that are recommended as part of a groundwater benefit zone solely due to hydrogeologic connection is the area of zone B1 not receiving treated water and zone E where the District manages aquifer recharge by Uvas and Llagas Creeks with releases from Uvas and Chsbro Reservoirs.

Table 12 shows a summary of the supporting analyses for each District activity by zone. Table 13 provides additional detail by each pumping area used in the groundwater level evaluation.

Table 12. Supporting Analyses by Zone and District Activity

			Supporting Analysis			
Zone	**Location/Geology**	**District Activity**	**Delivery Area**	**Groundwater Levels**	**Modeling**	**Hydrogeologic Connectivity**
A	Santa Clara Plain	Treated Water	🟦	🟦	🟦	🟦
		Managed Aquifer Recharge (Local)		🟦	🟦	🟦
		Managed Aquifer Recharge (Imported)		🟦	🟦	🟦
		Recycled Water			🟦	🟦
		Untreated Surface Water				🟦
B1	Santa Clara Formation	Treated Water	🟦			🟦
B2	Bedrock	Treated Water	🟦			
C	Coyote Valley	Managed Aquifer Recharge (Local)		🟦		🟦
		Managed Aquifer Recharge (Imported)		🟦		🟦
		Untreated Surface Water				🟦
D	Llagas	Managed Aquifer Recharge (Local)		🟦	🟦	🟦
		Managed Aquifer Recharge (Imported)		🟦	🟦	🟦
		Recycled Water			🟦	🟦
		Untreated Surface Water				🟦
E	Uvas/Llagas Creeks	Managed Aquifer Recharge (Local)				🟦
		Untreated Surface Water				🟦

Table 13. Supporting Analyses by Pumping Area and District Activity



Zone	Location/Geology	Area	District Activity																			
			Treated Water				MAR (Local)				MAR (Imported)				Recycled Water				Jntreated Surface Wate			
Zone	Location/Geology	Area	DA	GL	M	HC	DA	GL	M	HC	DA	GL	M	HC	DA	GL	M	HC	DA	GL	M	HC
A	Santa Clara Plain	Palo Alto: RWS	░	▦	🟩	🟨	░	▦	🟩	🟨	░	▦	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Cal Water Cupertino: TW	🟦	░	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Cal Water Los Altos: GW	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Cal Water Mountain View: GW	░	🟧	🟩	🟨	░	▦	🟩	🟨	░	▦	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Cal Water Sunnyvale: GW	░	▦	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Great Oaks: GW	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Milpitas: RWS	░	🟧	🟩	🟨	░	▦	🟩	🟨	░	▦	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Milpitas: TW	🟦	░	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Mountain View: RWS	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Mountain View: TW	🟦	░	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		San Jose Muni: RWS	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		San Jose Muni: TW	🟦	░	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Santa Clara:GW	░	▦	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Santa Clara: RWS GW	░	▦	🟩	🟨	░	▦	🟩	🟨	░	▦	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Santa Clara: TW GW	🟦	░	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		SJ Water Company East: TW	🟦	░	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		SJ Water Company Los Gatos: Local SW	░	▦	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		SJ Water Company North: GW	░	▦	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		SJ Water Company South: TW	🟦	░	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		SJ Water Company West: TW	🟦	░	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Stanford: RWS	░	▦	🟩	🟨	░	▦	🟩	🟨	░	▦	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Sunnyvale: RWS	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Sunnyvale: TW	🟦	░	🟩	🟨	░	▦	🟩	🟨	░	▦	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
B1	Santa Clara Formation	SJ Water Company Los Altos: TW	🟦	░	░	🟨	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		Palo Alto: RWS	░	░	░	🟨	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		SJ Water Company Cupertino: TW	🟦	░	░	🟨	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		SJ Water Company Los Gatos: Local SW	░	░	░	🟨	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		SJ Water Company West: TW	🟦	░	░	🟨	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		Stanford: RWS	░	░	░	🟨	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
B2	Bedrock	Cal Water Los Altos: TW	🟦	░	░	░	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		San Jose Muni: TW	🟦	░	░	░	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		SJ Water Company Cupertino: TW	🟦	░	░	░	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		SJ Water Company East: TW	🟦	░	░	░	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		SJ Water Compay South: TW	🟦	░	░	░	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
		SJ Water Company West: TW	🟦	░	░	░	░	░	░	▒	░	░	░	▒	░	░	░	▒	░	░	░	▒
C	Coyote Valley	North Morgan Hill: GW	░	▒	░	▒	░	🟧	░	🟨	░	🟧	░	🟨	░	░	░	▒	░	░	░	🟨
		Morgan Hill: GW	░	▦	░	▒	░	🟧	░	🟨	░	🟧	░	🟨	░	░	░	▒	░	░	░	🟨
		San Jose Muni: GW	░	▦	░	▒	░	🟧	░	🟨	░	🟧	░	🟨	░	░	░	▒	░	░	░	🟨
D	Llagas	Morgan Hill: GW	░	░	░	▒	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Eastern Llagas: (North and East of Gilroy)	░	░	░	▒	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
		Gilroy: GW	░	░	░	▒	░	🟧	🟩	🟨	░	🟧	🟩	🟨	░	░	🟩	🟨	░	░	░	🟨
E	Uvas/Llagas Creeks	Non-Retailer Area	░	░	░	▒	░	░	░	🟨	░	░	░	▒	░	░	░	▒	░	░	░	🟨

Supported by Delivery Area **(DA)**	🟦
Supported by Groundwater Levels **(GL)**	🟧
Supported by Modeling **(M)**	🟩
Supported by Hydrogeologic Connectivity **(HC)**	🟨
Benefit Unconfirmed for Specific Activity- Overlapping **(GL)**	▦
Analysis Not Used to Define Zone Boundaries	░
Benefit Not Supported by Existing Information	▒

GW = Retailer supplied by groundwater
TW = Retailer supplied by treated water

10.9 Economic Analysis

Table 14 shows the number of water supply wells in each of the proposed zones compared to the number of water supply wells in existing zones. Combining Table 11 and Table 14, along with association of all District activities with Zone W-2 and all but treated water deliveries and planned indirect potable reuse with Zone W-5, results in Table 15. Table 15 shows the number of water supply wells associated with each District activity for proposed zones compared to existing zones. This table will facilitate an economic analysis describing the change to revenue collection resulting from approving proposed zones. There is a decrease in the number of wells associated with each District activity except for treated water deliveries.

Table 14. Number of Water Supply Wells in Proposed Zones Versus Existing Zones

	Zone	Water Supply Wells By Zone	Total Water Supply Wells
Existing Zones	W-2	2,200	6,705
	W-5	4,505	
Proposed Zones	A	1,798	6,234
	B1	356	
	B2	68	
	C	559	
	D	3,156	
	E	297	

Table 15. Number of Water Supply Wells Associated with District Activities under Proposed Zones Versus Existing Zones

District Activity	Existing Zones	Proposed Zones	% Change
Managed Recharge (Local Runoff)	6,705	5,810	-13%
Managed Recharge (Imported Water)	6,705	5,513	-18%
Treated Water Deliveries	2,200	2,222	+1%
Recycled Water	6,705	4,954	-26%
Untreated Surface Water Deliveries	6,705	5,810	-13%
Conservation	6,705	6,234	-7%
Groundwater Protection	6,705	6,234	-7%
Planned Indirect Potable Reuse	2,200	1,798	-18%

11 FINALIZING GROUNDWATER BENEFIT ZONES

11.1 Administrative Issues

The Study recommends an increase in zones from two to six in order to associate zones with benefits from specific activities. However, the recommended zones are a result of a technical analysis that does not consider the related administration issues or requirements for new or revised zones. Any changes to the zones must be approved by the Board of Directors, which considers all related issues.

11.2 Technical Review Committee

The Technical Review Committee (TRC) provided review of the Study. The TRC members who reviewed the Study included Dr. Rebecca Nelson, professor at the University of Melbourne Law School, and Carl Hauge, retired chief hydrogeologist at California Department of Water Resources. After participating in a meeting to review the draft report for the Study in July 2017, TRC provided comments included in Appendix J.

11.3 Stakeholder Outreach

In addition to presentation of the methodology to stakeholders as described in Section 2.3, the District performed outreach to stakeholders following initial publication of the draft Study report in October 2017 through a public Board hearing on adoption of revised and new zones on April 28, 2020. The stakeholder outreach process was designed to facilitate an open, transparent process and solicit input from potentially impacted groundwater users and interested parties. This outreach included meetings with water retailers, direct mailings, open houses, presentations to Board committees and elected officials, meetings with individual groundwater users, phone conversations, and emails. Table 16 summarizes stakeholder outreach meetings and also references versions of the draft Study reports made available to stakeholders.

Table 16. Summary of Stakeholder Outreach Meetings on Study Results

Meeting Date	Stakeholder Group	Venue	Subject
2/9/2018	District Board of Directors and Interested Stakeholders	Board Meeting	Study Update
3/14/2018	Retailers Groundwater and Water Supply Subcommittees	Joint Subcommittee Meeting	Study Update
4/2/2018	District Board of Directors Agricultural Water Advisory Committee	Committee Meeting	Study Update
4/11/2018	Santa Clara Valley Water Commission	Committee Meeting	Study Update

Meeting Date	Stakeholder Group	Venue	Subject
7/9/2018	Stanford University	Meeting	Comments
7/11/2018	Retailers Groundwater and Water Supply Subcommittees	Joint Subcommittee Meeting	Study Update
10/3/2018	Retailers Groundwater and Water Supply Subcommittees	Joint Subcommittee Meeting	Study Update
1/7/2019	Retailers Groundwater and Water Supply Subcommittees	Joint Subcommittee Meeting	Study Update
3/6/2019	Great Oaks Water Company	Meeting	Comments
3/11/19	Retailers Groundwater and Water Supply Subcommittees	Joint Subcommittee Meeting	Study Update
4/18/2019	Los Altos Hills Town Council	Council Meeting	Study
4/30/2019	South County Interested Stakeholders	Open House	Study
5/7/2019	North County Interested Stakeholders	Open House	Study
5/8/2019	South County Interested Stakeholders	Open House	Study
5/14/2019	Saratoga Country Club	Meeting	Study Recommendations
5/15/19	Purissima Hills Water District Board of Directors	Board Meeting	Study
5/22/2019	Los Altos Hills groundwater users	Meeting	Study Recommendations
6/5/19	Retailers Groundwater and Water Supply Subcommittees	Joint Subcommittee Meeting	Study Update
7/17/19	Water Retailers Meeting	Meeting	Study Update
8/27/2019	District Board of Directors and Interested Stakeholders	Board Meeting	Study Preliminary Report and Recommendations
9/16/2019	Great Oaks Water Company, City of Palo Alto, Stanford University	Meeting	Comments on Study Technical Issues and Policy Perspectives beyond Study scope
10/8/2019	District Board of Directors and Interested Stakeholders	Board Meeting	Study Additional Information and Recommendations
2/27/20	Retailers Groundwater and Water Supply Subcommittees	Joint Subcommittee Meeting	Study Update
3/10/20	District Board of Directors and Interested Stakeholders	Board Meeting	Set Public Hearing to Consider Adopting Modified Existing Zones and Creating New Zones
4/28/2020	District Board of Directors and Interested Stakeholders	Board Meeting/Public Hearing	Public Hearing to Consider Adopting Modified Existing Zones and Creating New Zones

Great Oaks Water Company, City of Palo Alto, and Stanford University submitted detailed comments, which were discussed at length in meetings and District responses. About 40 individual groundwater users contacted the District via email, phone, or letter, some of whom provided site-specific studies, well logs, and other data in addition to comments. All comments were carefully considered, and the information submitted led to revised recommendations in some areas. Table 17summarizes formal correspondence with stakeholders and Appendix K provides comments and District responses.

Table 17. Summary of Stakeholder Outreach, Comment, and Response Letters on Study

Date	Sent By	**Addressed to**	**Subject**
3/23/2018	Stanford University	District	Zones of Benefit Study
5/11/2018	Stanford University	District	Zones of Benefit Study - Stanford Comments
Various 2018-2019	Various	District	Individual Comments on Study Recommendations
11/20/2018	District	Stanford University	Response to Stanford Comments on Preliminary Groundwater Benefit Zone Study Report
1/7/2019	Great Oaks Water Company	District	Comments and Questions to Preliminary Groundwater Zones of Benefit Study Prepared by HydroMetrics Water Resources Inc. (HydroMetrics WRI)
4/19/2019	District	Individual Well Owners Proposed to be Added to Zone	Notice of Groundwater Benefit Zone Study Open Houses
4/19/2019	District	Individual Well Owners Proposed to be Removed from Zone	Notice of Groundwater Benefit Zone Study Open Houses
4/30/2019	District	Individual Well Owners Proposed to be Added to Zone	Notice of Groundwater Benefit Zone Study Open Houses
4/30/2019	District	Individual Well Owners Proposed to be Removed from Zone	Notice of Groundwater Benefit Zone Study Open Houses
6/27/2019	District	Individual Well Owners (Districts 1-6)	Update on the Groundwater Benefit Zone Study
7/10/2019	District	Elected Officials (Cupertino, Gilroy, Morgan Hill, San Jose, Saratoga, Santa Clara County)	Update on the Groundwater Benefit Zone Study
7/10/2019	District	Individual Well Owners (District 7)	Update on the Groundwater Benefit Zone Study
7/12/2019	District	Purissima Hills Water District	Update on the Groundwater Benefit Zone Study
7/12/2019	District	Town of Los Altos Hills	Update on the Groundwater Benefit Zone Study
7/16/2019	Stanford University	District	Zones of Benefit Study - Stanford Comments on SCVWD's Response to previous Stanford Comments
7/19/2019	Great Oaks Water Company	District	Comments on Preliminary Groundwater Zones of Benefit Study
7/20/2019	City of Palo Alto	District	Comments on Preliminary Groundwater Zones of Benefit Study
8/21/2019	District	Great Oaks Water Company	Great Oaks Water Company Comments on the Preliminary Groundwater Benefit Zone Study Report
8/21/2019	District	City of Palo Alto	City of Palo Alto Comments on the Preliminary Groundwater Benefit Zone Study Report

Date	Sent By	Addressed to	Subject
9/13/2019	Stanford University	District	Luhdorff & Scalmanini Memo: Preliminary Responses to SCVWD Letter Dated August 21, 2019 and Montgomery Associates Letter Dated August 16, 2019
9/18/2019	Stanford University, City of Palo Alto, Great Oaks Water Company	District	Comments Summary and Proposal for Staff Report
9/24/2019	District	Stanford University	Response to Luhdorff & Scalmanini's September 13, 2019 Technical Memorandum on the Groundwater Benefit Zone Study
10/8/2019	Stanford University	District	Stanford Comments on District letter dated September 29, 2019
10/8/2019	Great Oaks Water Company	District	Board of Directors Meeting October 8, 2019 – Agenda Item 5.1
4/9/2020	District	Individual Well Owners	Announcement of Public Hearing: April 28, 2020
4/24/2020	Stanford University	District	April 28, 2020 Board of Directors Meeting – Agenda Items 2.3 and 2.4
7/1/2020	District	Individual Well Owners Added to Zone	Update on the Groundwater Benefit Zone Study
7/1/2020	District	Individual Well Owners Removed from Zone	Update on the Groundwater Benefit Zone Study

11.4 Staff Recommendation

District staff presented this Study to the District Board of Directors on August 27, 2019. Based on evaluation of the Study and consideration of information received during the stakeholder process for the Study, staff recommended implementation of four of the six zones proposed in the Study as follows:

- Modified Zone W-2, the Santa Clara Plain Valley Floor, which matches Zone A proposed by the Study.
- Modified Zone W-5, the Llagas Subbasin Valley Floor, which matches Zone D proposed by the Study.
- New Zone W-7, the Coyote Valley, created to match Zone C proposed by the Study.
- New Zone W-8, the Llagas Subbasin Alluvium below Uvas and Chesbro Reservoirs, created to match Zone E proposed by the Study.

District staff did not recommend implementation of Zones B1 and B2 proposed by the Study. This recommendation was based on the significant uncertainty of the hydrogeologic connection and limited available data in the Santa Clara Formation and bedrock areas as noted by the Study.

At the August 27, 2019 meeting, the Board of Directors directed staff to meet with stakeholders that expressed concerns with the recommended zones. Staff provided a summary of the meeting with stakeholders at the October 8, 2019 Board meeting. At this meeting, staff continued to recommend the four zones as described above. The Board approved the staff-recommended changes to the zones and directed that metes and bounds descriptions be prepared.

11.5 Metes and Bounds

The District Act requires the groundwater benefit zones to be defined by metes and bounds so that groundwater charges can be assessed to groundwater users.

In order to facilitate creation of the metes and bounds, Towill, Inc., the surveyor subcontractor on HydroMetrics WRI's consulting team, recommended taking steps to make changes to the zones to facilitate descriptions with metes and bounds. Since the proposed zones are based on geologic maps, the boundaries include many line segments that would each need to be described. In order to reduce requirements for metes and bounds descriptions, the boundaries were simplified to reduce the number of line segments making up the boundaries. In addition to minimizing the number of line segments, zone boundaries at geologic boundaries have been adjusted to account for available information on the uncertainty of those boundaries. As described in Appendix L-1, this approach involved a two-step process:

1. Simplify the boundaries based on mapped geology by applying a documented algorithm available in GIS software to reduce line segments with a specified distance tolerance.
2. Shift simplified boundaries a distance that accounts for uncertainty of geologic boundaries.

The approach to metes and bounds for the proposed zones is different from the metes and bounds for existing zones. The metes and bounds for existing zones make calls to land parcels, which is a typical approach for supporting real estate definitions and transactions but would be very costly to replicate for the proposed zones covering large areas. The approach for the proposed zones is to use bearings and distances on the California State Plane Coordinate System Zone 3 to describe the area of each zone. Appendix L-2 includes an excerpt from the proposal by Frank Borges, PLS, of Towill, Inc. dated March 10, 2017 that describes this approach.

Although the metes and bounds for the proposed zones do not include calls to established boundary lines such as land parcels, the metes and bounds do include calls to control monuments surveyed for the Groundwater Benefit Zone Study. The inclusion of these control monuments will facilitate future surveying of the sections of any zone for comparison with well locations without having to survey from the initial commencement point. A draft record of survey map including the control monuments and the zones was submitted to the Santa Clara County Surveyor's Office on June 30, 2020 with County Surveyor comments provided in November 2020. A revised record of survey that addresses the comments will be resubmitted. Appendix L-3 will be updated with the final record of survey when filed.

Following a public hearing on April 28, 2020, the District Board of Directors adopted resolutions to amend boundaries of Zones W-2 and W-5 and establish new Zones W-7 and W-8 as described by the metes and bounds. The effective date for the adopted zones is July 1, 2020. Appendix L-4 through L-7 includes the adopted metes and bounds for the four zones.

12 SUMMARY OF FUTURE PROCEDURES

12.1 Procedure for Well Exemption

Appendix M proposes a process for the District to evaluate requests to exempt or re-assign production wells from a groundwater benefit zone and, potentially exempt water produced from the well from all or part of a groundwater charge. The District Act requires the groundwater benefit zone to be modified if a well is found to be exempt.

This process includes the following general changes from the current process for evaluating requests for exemptions from the groundwater benefit zone, detailed in District Document No. SOP465-103 (SCVWD, 2011):

1. This process assesses exemption of wells from the groundwater benefit zone and potentially modifying the process to remove the well. The previous process provided a method for removing parcels from the groundwater benefit zone.
2. Instead of removing parcels from a groundwater benefit zone, an evaluation that a well should be exempt from a benefit zone will result in modification of the zone consistent with boundary simplification approach implemented for legal descriptions of the zones (Section 9.2).
3. The well may not be fully exempt from groundwater benefit zone and may be re-assigned with a different zone that is associated with a different set of District activities.
4. Consistent with the Study, exemptions will be evaluated based on any relevant evidence not considered for the Study.
5. If exemption is approved to remove a well from the groundwater benefit zone, the zone will be modified based on best approximation of geology.

12.2 Procedure for Future Review

Appendix N presents a process for the District to conduct future reviews of the groundwater benefit zones.

Unlike the process for exemptions from a groundwater benefit zone, this process involves a comprehensive review of the boundaries of the groundwater benefit zones.

1. This process to review groundwater benefit zones does not occur in response to requests for exemption from a well owner. A separate process describes exemption or re-classification of individual wells from a benefit zone (Section 12.1).

2. Currently, reviews are only initiated at District staff's discretion, and upon receipt of new information. This new process requires a review of groundwater benefit zones if either of the following specified situations occur:
    a. Substantial changes to the type of District activities that provide the zone's benefits
    b. Significant new hydrogeologic data become available.

    Initiating review under these specified situations, the process helps ensures the groundwater benefit zones represent current District activities and the best available hydrogeologic information.

3. The review tasks differ based on the situation that initiates the review.

This page intentionally
left blank

13 REFERENCES

Abuye, C., 2016, *Llagas subbasin modeling results for Groundwater Charge ZOB study*, memorandum to G. Cook and V. de la Piedra, July 29.

Brabb, E.E., R.W. Graymer, and D.L. Jones, 2000, *Geologic map and map database of the Palo Alto 30' x 60' quadrangle, California*, U.S. Geological Survey MAP MF-2332 Version 1.0.

California Department of Water Resources, 2004, *California's Groundwater Bulletin 118: Central Coast Hydrologic Region, Gilroy-Hollister Groundwater Basin, Llagas Subbasin*, http://www.water.ca.gov/groundwater/bulletin118/basindescriptions/3-03.01.pdf, last updated February 27.

_____, 2004, *California's Groundwater Bulletin 118: San Francisco Bay Hydrologic Region, Santa Clara Valley Groundwater Basin, Santa Clara Subbasin*, http://www.water.ca.gov/groundwater/bulletin118/basindescriptions/2-09.02.pdf, last updated February 27.

CH2M Hill, 1992, *Santa Clara Valley Groundwater Model Project: Draft Technical Memorandum*, Draft Technical Memorandum, November.

_____, 2005, *Llagas Basin Numerical Groundwater Report*, prepared for Santa Clara Valley Water District, May.

City of Milpitas, 2015, *Water Quality in 2014,* Consumer Confidence Report, June.

City of Mountain View, 2005, *Water Service Area*, September 12.

_____, 2008, *Water Source Boundary Areas*, April 30.

City of Santa Clara, 2012, *Water Source Service Map*, October 31.

Galloway D., D.R. Jones, and Ingebritsen S.E., 2000, *Measuring land subsidence from space*, U.S. Geological Survey Fact Sheet 051-00, April.

Great Oaks, undated, Public Utilities Commission (PUC) grid.

Hanson, R.T., Z. Li, and C.C. Faust, 2004, *Documentation of the Santa Clara Valley Regional Ground-Water/Surface-Water Flow Model, Santa Clara, California*, U.S. Geological Survey Scientific Investigations Report 2004-5231.

Liu Y. and X. Zhan, 2016, *Santa Clara Plain Groundwater Modeling for the Benefit zone Study*, Memorandum to George Cook, Santa Clara Valley Water District, August 5.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2009, *Llagas Subbasin Characterization -2008: Santa Clara County Olin/Standard Fusee Morgan Hill, California*, prepared for Olin Corporation, January 30.

Santa Clara Valley Water District (SCVWD), 1938, *Construction Plans: 9261-61*, Facility O&M manual, RWOU March.

SCVWD, 1998, *Water Supply and Distribution Facilities*, July.

SCVWD, 2010. 2010 Baseline Groundwater Recharge Facility Capacity by Zone, October 26.

SCVWD, 2011, *Groundwater Charge Zone Modification Process,* Document No. SOP465-103, December 28.

SCVWD, 2012, *South County Water Quality Testing Report.*

SCVWD, 2014, *FY 2014-15 Protection and Augmentation of Water Supplies*, February.

SCVWD, 2016a, Geographic Information System.

SCVWD, 2016b, Groundwater Management Plan, November.

SCVWD and AECOM, 2014a. City of Gilroy Infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, April 15.

SCVWD and AECOM 2014b, City of Sunnyvale Infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, April 15.

SCVWD and AECOM 2014v, Great Oaks Water Company Infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, April 18.

SCVWD and AECOM, 2014d, City of Morgan Hill infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, April 23.

SCVWD and AECOM, 2014e, California Water Services Co. Los Altos Suburban District Infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, May 5.

SCVWD and AECOM, 2014f, City of Milpitas Infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, May 5.

SCVWD and AECOM 2014g, San Jose Municipal Water Service Infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, May 5.

SCVWD and AECOM 2014h, San Jose Water Company Infrastructure System, Infrastructure Reliability, May 5.

SCVWD and AECOM 2014i, City of Santa Clara Infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, May 7.

SCVWD and AECOM 2014j, City of Mountain View Infrastructure System, Infrastructure Reliability Project, Task 3, technical memorandum, May 13.

USGS, 2016, National Hydrography dataset, https://nhd.usgs.gov/data.html.

U.S. Geological Survey and California Geological Survey, 2010, *Quaternary fault and fold database for the United States*, http//earthquakes.usgs.gov/hazards/qfaults/.

Walker and Williamson, 1983, *Water from Power: Water Supply and Regional Growth in the Santa Clara Valley*, Economic Geography, volume 58:2, April.

Wentworth, C. M., M.C. Blake Jr, R.J. McLaughlin, & R.W. Graymer, 1999, *Preliminary geologic map of the San Jose 30 x 60-minute quadrangle, California*; U.S. Geological Survey digital database No. 98-795.

Wentworth, C.M., R.C. Jachens, R.A. Williams, J.C. Tinsley, and R.T. Hanson, 2015, *Physical Subdivision and Description of the Water-Bearing Sediments of the Santa Clara Valley, California*, U.S. Geological Survey Scientific Investigations Report 2015-5017, April 6.

Witter, R.C., K.L. Knudsen, J.M. Sowers, C.M. Wentworth, R.D. Koehler, and C.E. Randolph, 2006, *Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California*, U.S. Geological Survey Open File Report 2006-1037 Version 1.1.

14 ABBREVIATIONS

Alluvium	Sediments primarily stream deposits of Quaternary age
Cal Water	California Water Service Company
CGS	California Geological Survey
District	Santa Clara Valley Water District
DWR	California Department of Water Resources
GIS	Geographic Information System
GW	Retailer area where groundwater supply is delivered
Local SW	Area receives San Jose Water Company surface water supply
NGS	National Geodetic Survey
PLS	Professional Land Surveyor
RWS	Retailer area receives water from SFPUC Regional Water Supply System
SBWRP	South Bay Water Recycling Program
SCRWA	South County Regional Wastewater Authority
SCVWD	Santa Clara Valley Water District
SFPUC	San Francisco Public Utilities Commission
SVAWPC	Silicon Valley Advanced Water Purification Center
Study	Groundwater Benefit Zone Study
TDS	Total Dissolved Solids
TW	Retailer area receives SCVWD treated water deliveries
USGS	United States Geological Survey

Appendix A

Methodology Memorandum

Methodology for Evaluating Groundwater Zones of Benefit Santa Clara County, California

Prepared for:
Santa Clara Valley Water District

August 2016

Prepared by:

HydroMetrics WRI

11570100.1

Page intentionally left blank

EXECUTIVE SUMMARY

The Santa Clara Valley Water District (District) Act gives the District Board of Directors the authority to establish, amend, and revise groundwater charge zones and to levy and collect groundwater charges within a zone or zones that benefit from the recharge of underground water supplies or the distribution of imported water. The two primary existing charge zones, Zones W-2 and W-5, were established in 1963 and 1977, respectively. Zone W-2 generally covers the Santa Clara Plain in North County while Zone W-5 generally covers the Coyote Valley and Llagas Subbasin in South County

The purpose of the Groundwater Zone of Benefit Study (Study) is to complete a holistic review of the groundwater charge zones to ensure they reflect areas where current and future groundwater users receive similar benefit from current and planned District activities. Although the District is not aware of any specific problems with the existing Zone of Benefit designations, the District has received requests for exemption and recognizes that it is important for the District to periodically undertake an updated analysis of various factors upon which the zones are based and revise the boundaries if necessary. The Study will evaluate the ways in which the various District activities benefit groundwater users. These benefits are derived not only from the use of alternative water supplies for direct recharge, but also include the direct and indirect benefits of the District's holistic groundwater management, including in-lieu recharge, demand management, development of alternative water supplies and storage, conservation, and protection of water quality, amongst others.

An area within the District's legal jurisdiction will be included in a groundwater zone of benefit if any of the following criteria are met:

- Water supply is provided by a District activity
- Groundwater supply reliability is improved due to District activities
- Land subsidence is prevented or limited due to District activities
- Saltwater intrusion is reversed or controlled due to District activities
- Groundwater quality is improved or maintained due to District activities
- Groundwater levels are improved due to District activities

Historical data and groundwater modeling will be used to assess the areas benefitting from District activities. If data and modeling are insufficient to assess whether an area benefits from District activities, the following assumptions will be made:

- Benefits from District activities extend to all areas that are hydrogeologically connected.

- Adjacent bedrock areas are not benefitting from District activities unless they are receiving District supply.

Evaluating groundwater zones of benefit is based on the hydrogeological characteristics that govern the movement of groundwater, District activities, and the benefits to groundwater users provided by the activities. The following methodology will be used to complete the study:

1. Map current and planned District activities that provide or will provide benefits to groundwater users in the District.
2. Map hydrogeologic features and groundwater occurrence and movement to define hydrogeologically connected areas.
3. Plot water balance over time in hydrogeologically connected areas to assess where the benefit of District activities can be demonstrated.
4. Use groundwater data and groundwater flow models to demonstrate the benefit of District activities.
5. Create recommended zones of benefit by grouping areas where users benefit from a similar set of District activities.

The evaluation of where groundwater users benefit from specific District activities will consider hydrogeologically connected areas and multiple lines of evidence. The lines of evidence can be grouped as follows:

1. Data demonstrating benefits derived from improved groundwater levels associated with District activities. In addition to groundwater level data, this includes the evaluation of land subsidence and saltwater intrusion data.
2. Groundwater model results demonstrating improved groundwater levels as a result of District activities have occurred or are projected to occur.
3. Data related to improved groundwater quality associated with District managed aquifer recharge.

All available information will be considered in identifying areas benefitting from specific District activities. Zones will be proposed for areas receiving benefits from similar sets of District activities.

INTRODUCTION

The Santa Clara Valley Water District (District) Act gives the District Board of Directors the authority to establish, amend, and revise groundwater charge zones and to levy and collect groundwater charges within a zone or zones that benefit from the recharge of underground water supplies or the distribution of imported water. The two primary existing charge zones, Zones W-2 and W-5, were established in 1963 and 1977, respectively. Zone W-2 generally covers the Santa Clara Plain in North County while Zone W-5 generally covers the Coyote Valley and Llagas Subbasin in South County (Figure 1). Figure 2 shows the three groundwater management areas of the District (Santa Clara Plain, Coyote Valley, and Llagas Subbasin) along with the California Department of Water Resources (DWR) subbasin definitions. Coyote Valley is part of southern zone W-5, but DWR includes Coyote Valley with the Santa Clara Subbasin in the north. While District water supply activities have changed considerably since the zones were established, the zones themselves have undergone only relatively minor, parcel-based revisions.

The purpose of the Groundwater Zone of Benefit Study (Study) is to complete a holistic review of the groundwater charge zones to ensure they reflect areas where current and future groundwater users receive similar benefit from current and planned District activities. The benefits to those who receive groundwater supplies are derived from the occurrence of groundwater and its movement through the sediments below ground surface. Therefore, the methodology will consist of hydrogeologic analyses consistent with existing understanding of the groundwater basins.

The Study will evaluate the ways in which the various District activities benefit groundwater users in different ways across the District. These benefits are derived not only from the use of alternative water supplies for direct recharge, but also include the direct and indirect benefits of the District's holistic groundwater management, including in-lieu recharge, demand management, development of alternative water supplies and storage, conservation, and protection of water quality, amongst others. Furthermore, due to the interconnected nature of the groundwater system, benefits are not limited to the immediate vicinity of particular District activities. Rather, benefits can extend from a project location throughout a surrounding basin or subbasin. Areas where groundwater users receive reasonably similar benefits or similar potential benefits from District activities, regardless of their surface proximity to District activities, will be grouped into zones. The purpose of this technical memorandum is to describe the approach and methodology for establishing the zones of benefit so that it can be reviewed and commented on by District partners and stakeholders.

As background for developing the methodology for this Study, HydroMetrics WRI conducted a cursory statewide review of other groundwater management agencies that have created multiple groundwater zones of benefit to determine the methodologies used to define the zones. A report summarizing the findings from that research is attached as Appendix A. The two significant findings are: 1) not many agencies who have the legal authorization to create groundwater zones of benefit have done so, meaning that the costs of groundwater management activities are spread throughout the agency's jurisdiction without making a distinction between benefits in different areas; 2) six agencies were identified that have developed a methodology for determining zone boundaries. Methods used by these six agencies to define zones of benefit vary between following DWR subbasin boundaries; identifying sub-areas based on hydrogeologic features; or creating a separate zone for areas benefitting from a singular beneficial activity such as delivered water. None of the agencies identified have undertaken the level of benefit analysis to justify the zone boundaries that will be performed in this Study.

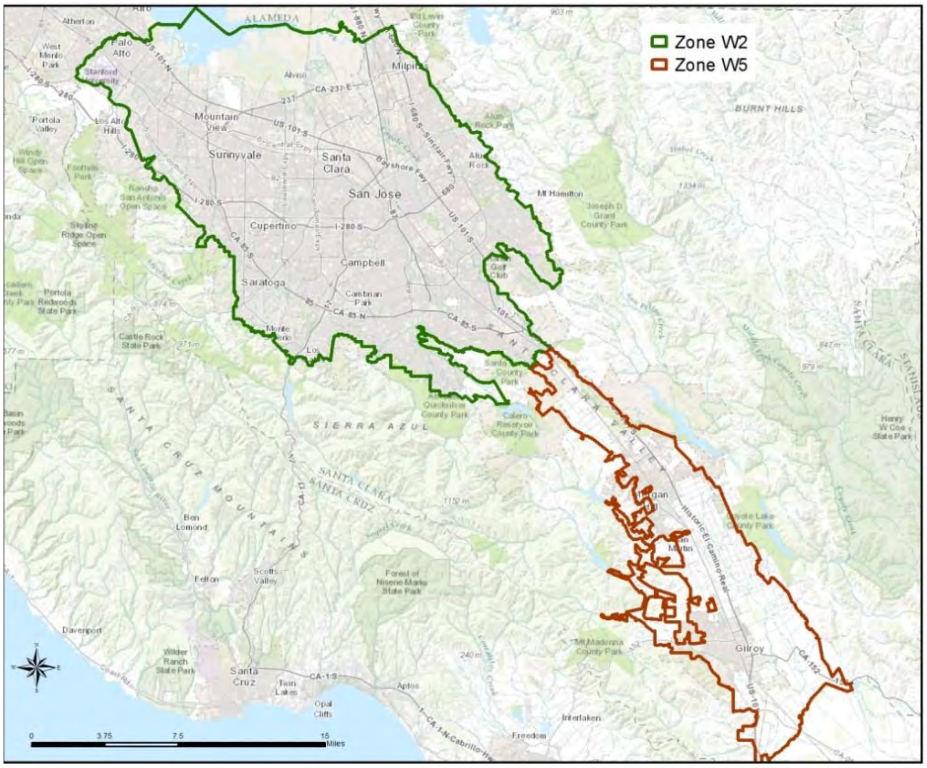


Figure 1: Existing Zones of Benefit

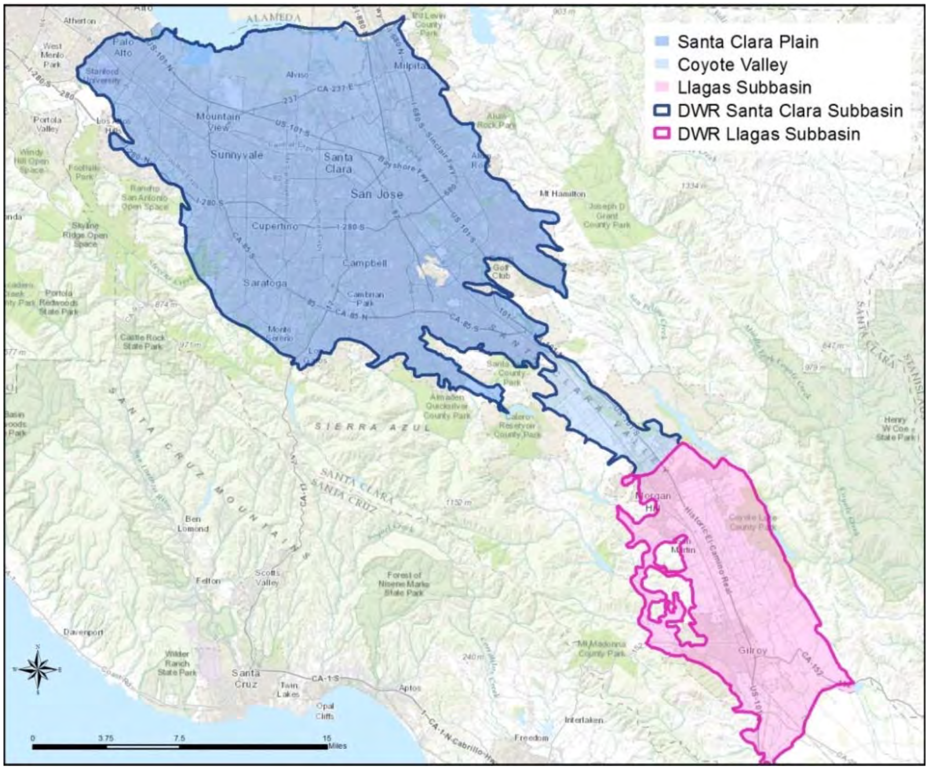


Figure 2: DWR Bulletin 118 Subbasins and District Groundwater Management Areas

CONCEPTS FOR EVALUATING GROUNDWATER ZONES OF BENEFIT

The proposed evaluation of groundwater zones of benefit is based on the hydrogeological characteristics that govern the movement of groundwater, District activities, and the benefits to groundwater users provided by the activities. First, we identify District activities that may provide benefits will be mapped. Second, we map hydrogeologically connected areas to the District activities. Third, we will map the areas where benefits to groundwater users from District activities are demonstrated. The recommended zones will be based on areas receiving benefit from similar District activities based on the analysis of hydrogeologically connected areas and observed and modeled groundwater data.

SUMMARY OF GROUNDWATER ZONE OF BENEFIT CRITERIA

An area within the District's legal jurisdiction will be included in a groundwater zone of benefit if any of the following criteria are met:

- Water supply is provided by a District activity
- Groundwater supply reliability is improved by District activities
- Land subsidence is prevented or limited due to District activities
- Saltwater intrusion is reversed or controlled due to District activities
- Groundwater quality is improved or maintained due to District activities
- Groundwater levels are improved due to District activities

Historical data and groundwater modeling will be used to assess the areas benefitting from District activities. If data and modeling are insufficient to assess whether an area benefits from District activities, the following assumptions will be made:

- Benefits from District activities extend to all areas that are hydrogeologically connected.
- Adjacent bedrock areas are not benefitting from District activities unless they are receiving District supply.

DISTRICT ACTIVITIES PROVIDING BENEFIT

District activities that provide a benefit to groundwater users include those covered under the District Act:

- Groundwater recharge,
- Importing water,
- Runoff capture,
- Water storage,
- Water treatment,

- Water distribution,
- Water recycling,
- Groundwater protection, and
- Water conservation.

The primary benefits to groundwater users are derived from District activities that support groundwater recharge. Managed aquifer recharge improves groundwater conditions by supplementing natural recharge of the underlying aquifers. Activities that support managed aquifer recharge are shown in

Figure 3. The District's direct delivery of water through various combinations of District activities, also shown in

Figure 3, improves groundwater conditions by reducing groundwater extractions; this is referred to as in-lieu recharge. Demand management through water conservation programs also constitutes in-lieu recharge.

Additional benefits are derived from the District's groundwater protection programs, which improve groundwater conditions by maintaining or improving groundwater quality. Protecting groundwater quality is inextricably linked to water supply reliability as are District efforts to conserve and augment groundwater supplies.

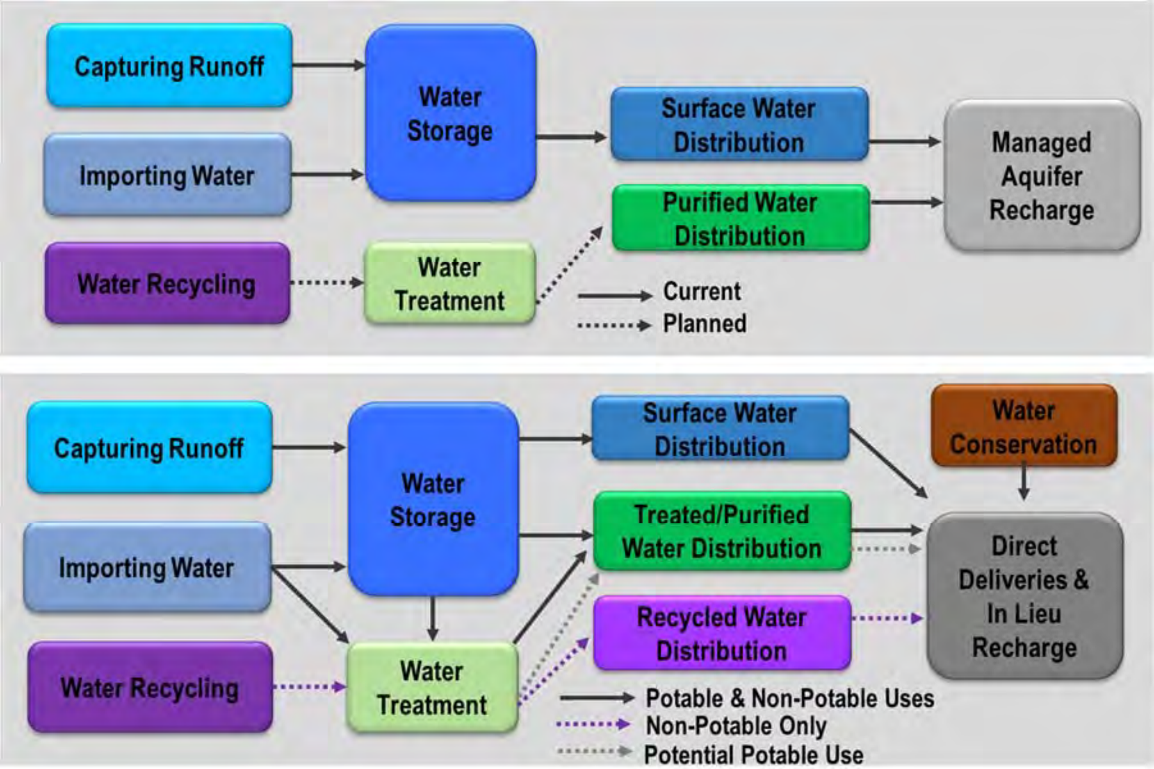


Figure 3: District Activities Supporting Groundwater Recharge For Benefit of Groundwater Users

BENEFITS OF DISTRICT GROUNDWATER MANAGEMENT ACTIVITIES

Groundwater is a shared resource that can be represented by a water budget, which includes estimates of groundwater inflows and outflows and conjunctive use of surface water supplies within a given area. Improved groundwater conditions resulting from District groundwater management activities can be summarized by an improved water budget, i.e. groundwater conditions would be worse in the absence of District activities. An improved water budget represents the overall benefit of District managed aquifer recharge and in-lieu recharge activities that sustain an area's groundwater supply. As an example, District activities in calendar year 2013 resulted in 96,000 acre-feet of managed aquifer recharge and 129,000 acre-feet of in-lieu recharge compared to 39,000 acre-feet of natural recharge (SCVWD, 2014). District activities that result in an improved water budget provide the following benefits to groundwater users:

Improved Groundwater Supply Reliability

On average, forty percent of the water used in Santa Clara County comes from wells pumping groundwater. Groundwater pumping (approximately 150,000 acre-feet in 2013) far exceeds natural recharge, and the District's managed and in-lieu recharge programs help replenish and sustain groundwater supplies. Figure 4 shows the rapidly growing population of Santa Clara County after World War II that was supported by a groundwater supply improved by District activities. This groundwater supply also supported high rates of business development and a viable agricultural economy. Community growth, quality of life and economic prosperity depend on a reliable and sustainable water supply that can be attributed to District groundwater management activities.

Reduced Risk of Land Subsidence

As shown in Figure 4, land in portions of the Santa Clara Valley subsided approximately 13 feet between 1915 and 1970 when groundwater pumping generally exceeded recharge. During that time, there was at least a 1-foot drop in the land surface over a 100-square mile area including portions of Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose. Since then, permanent subsidence has been halted due to an improved water budget resulting from District activities. Subsidence can result in adverse effects such as damaged infrastructure, increased flooding risk, increased sediment erosion or deposition, and, where relevant, impairment of leveled agricultural fields. Therefore, preventing subsidence is a benefit of the improved water budget resulting from District activities.

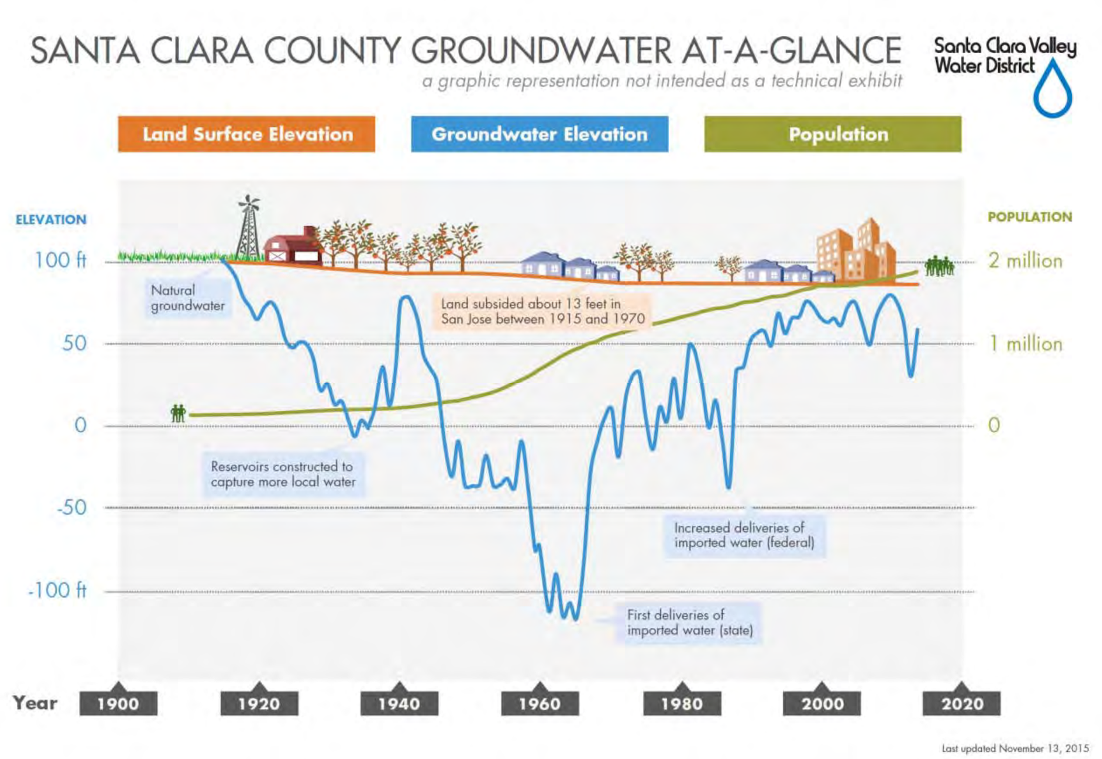


Figure 4: Graphic Representation of Groundwater Levels, Population and Land Subsidence (Courtesy SCVWD)

Saltwater Intrusion Prevention

Historically, denser saltwater moved inland from brackish channels connected to the San Francisco Bay when groundwater pumping exceeded natural recharge and subsidence resulted in greater tidal influence on the creeks connected to the bay. Figure 5 shows the inland migration of saltwater intrusion in the shallow aquifer zone from 1945 to 1980. Figure 5 additionally illustrates the reversal of saltwater intrusion in the shallow zone from 1980 to 2012. Saltwater intrusion adversely affects groundwater quality and can consequently have an adverse effect on groundwater use. Therefore, preventing saltwater intrusion is a benefit of the improved water budget from District activities.

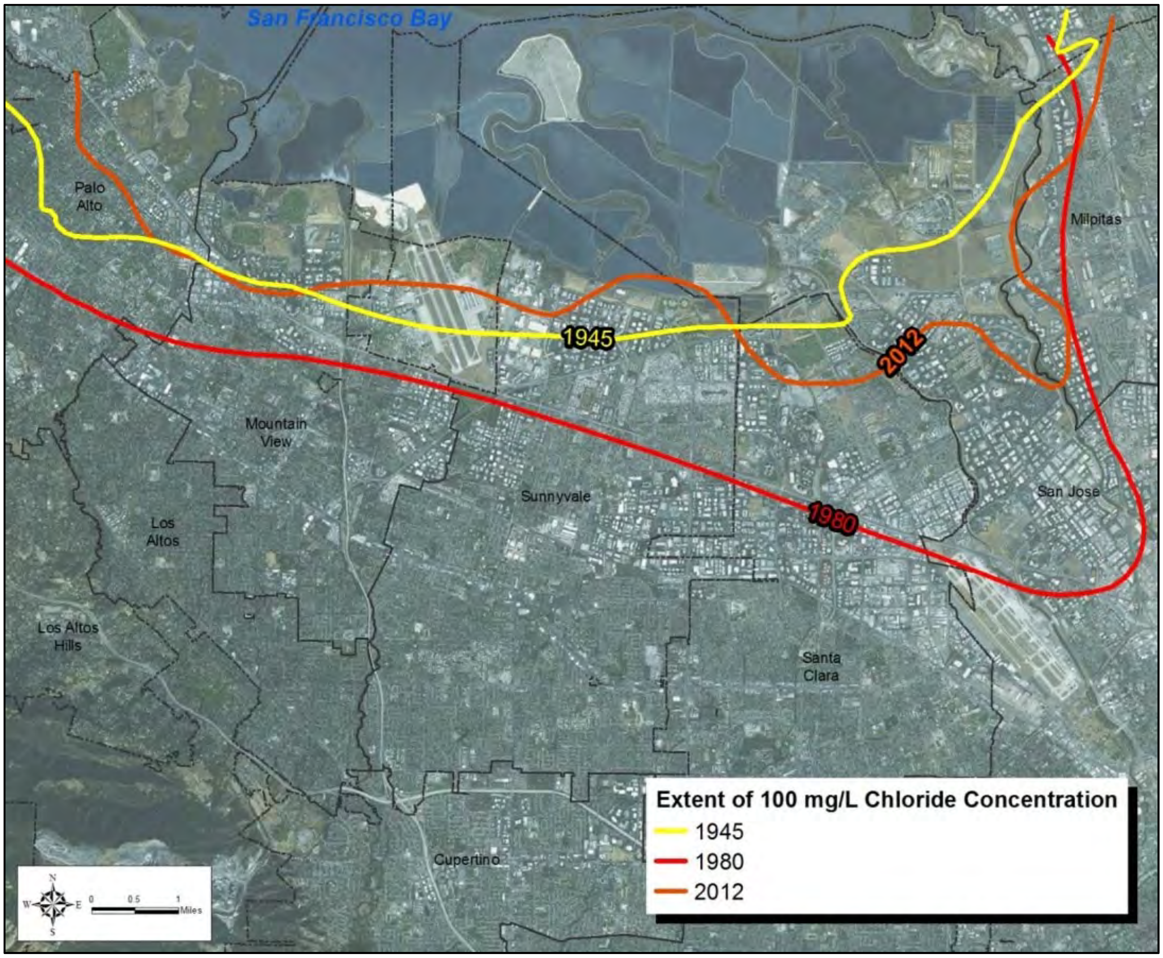


Figure 5. Extent of Shallow Zone Saltwater Intrusion

Improved Groundwater Quality

Recharge water can be higher quality than the ambient groundwater so an improved water budget from District activities can also improve groundwater quality. For example, nitrate concentrations are high in ambient groundwater in portions of the Llagas Subbasin, but imported water used for managed aquifer recharge has a dilution benefit by adding water with low nitrate concentrations to the water budget (MACTEC, 2009). Groundwater protection activities also conserve and improve groundwater quality. This prevents depletion of groundwater supply due to groundwater quality concerns and helps maintain an improved water budget.

MAPPING EXTENT OF BENEFITS BASED ON HYDROGEOLOGIC FEATURES

The initial evaluation of the areal extent of benefits from District activities will be based on defining hydrogeologically connected areas. District activities that improve the water budget are assumed to benefit all groundwater users within the hydrogeologically connected area subject to further evaluation with data and models described below. The areal extent of benefit beyond the District activity will be initially defined by mapping hydrogeologic features that control groundwater flow, such as the contact between water-bearing sediments and bedrock, the thickness of the water-bearing sediments, and the location of groundwater divides and faults. Mapping these features will form the boundaries of hydrogeologically connected areas that will be the first step for defining zones.

EVALUATING EXTENT OF BENEFITS WITH DATA AND MODELS

Field data, including groundwater levels, land subsidence, saltwater intrusion, and groundwater quality, will be evaluated to map the extent of benefits associated with District activities. Comparison of model simulations with and without District activities will also be used to map the extent of benefits. These maps will show areas where users receive benefits from a similar set of District activities. A defined zone of benefit will be created for each of these areas. There may be spatial data gaps, particularly along the subbasin margins, so areas demonstrated to be receiving benefit will be extended based on hydrogeologically connected areas as discussed above.

METHODOLOGY FOR EVALUATION OF GROUNDWATER ZONES OF BENEFIT

Groundwater zones of benefit will be defined initially based on areas of hydrogeologic connection and refined, if necessary, based on where benefits are demonstrated from a specific set of District activities. Groundwater flow extends benefits beyond the immediate location of activities to hydrogeologically connected areas. Benefits from current and planned District activities within initially defined hydrogeologic areas will be evaluated based on historical data and groundwater model results. The methodology to evaluate the zones of benefit will rely on a four-step process:

1. Map current and planned District activities that provide or will provide benefits to groundwater users in the District.
2. Map hydrogeologic features and groundwater occurrence and movement to define hydrogeologically connected areas.
3. Plot water balance over time in hydrogeologically connected areas to demonstrate overall benefit of District activities.

4. Use groundwater flow models and groundwater data to demonstrate the benefit of District activities.
5. Create recommended zones of benefit by grouping areas where users benefit from a similar set of District activities.

IDENTIFY AND MAP DISTRICT ACTIVITIES

As shown on
Figure 3, the two main categories of District activities that provide groundwater benefits are managed aquifer recharge and in-lieu recharge. The managed aquifer recharge facilities and end-point uses of deliveries that result in in-lieu recharge will be identified and mapped. The mapping of activities is illustrated on Figure 6 which contains a series of hypothetical maps for demonstrating the methodology.

Managed Aquifer Recharge Activities

Managed aquifer recharge occurs in District recharge ponds (off-stream recharge) and within streambeds (in-stream recharge). Geographic Information System (GIS) data of pond and stream features mapped by the District will be used to define these locations (Figure 6A). Benefits from managed aquifer recharge extend beyond the immediate area of recharge.

In order to evaluate the areal extent where groundwater users receive benefit from District managed aquifer recharge activities, recharge volumes will be plotted over time at each recharge system using data from the District. Recharge volumes over time represent changes in District activity that can be associated with groundwater benefits. When data or estimates for recharge volumes are not available for historical periods, periods when recharge volumes increased or decreased can be identified based on qualitative information such as commencement of recharge at any location.

In addition to identifying locations of current recharge from captured local runoff and imported surface water, potential locations of recharge from purified recycled water (Indirect Potable Reuse or IPR) will also be mapped. IPR is in the planning stage and is expected to be implemented by the District within the next 5 years.

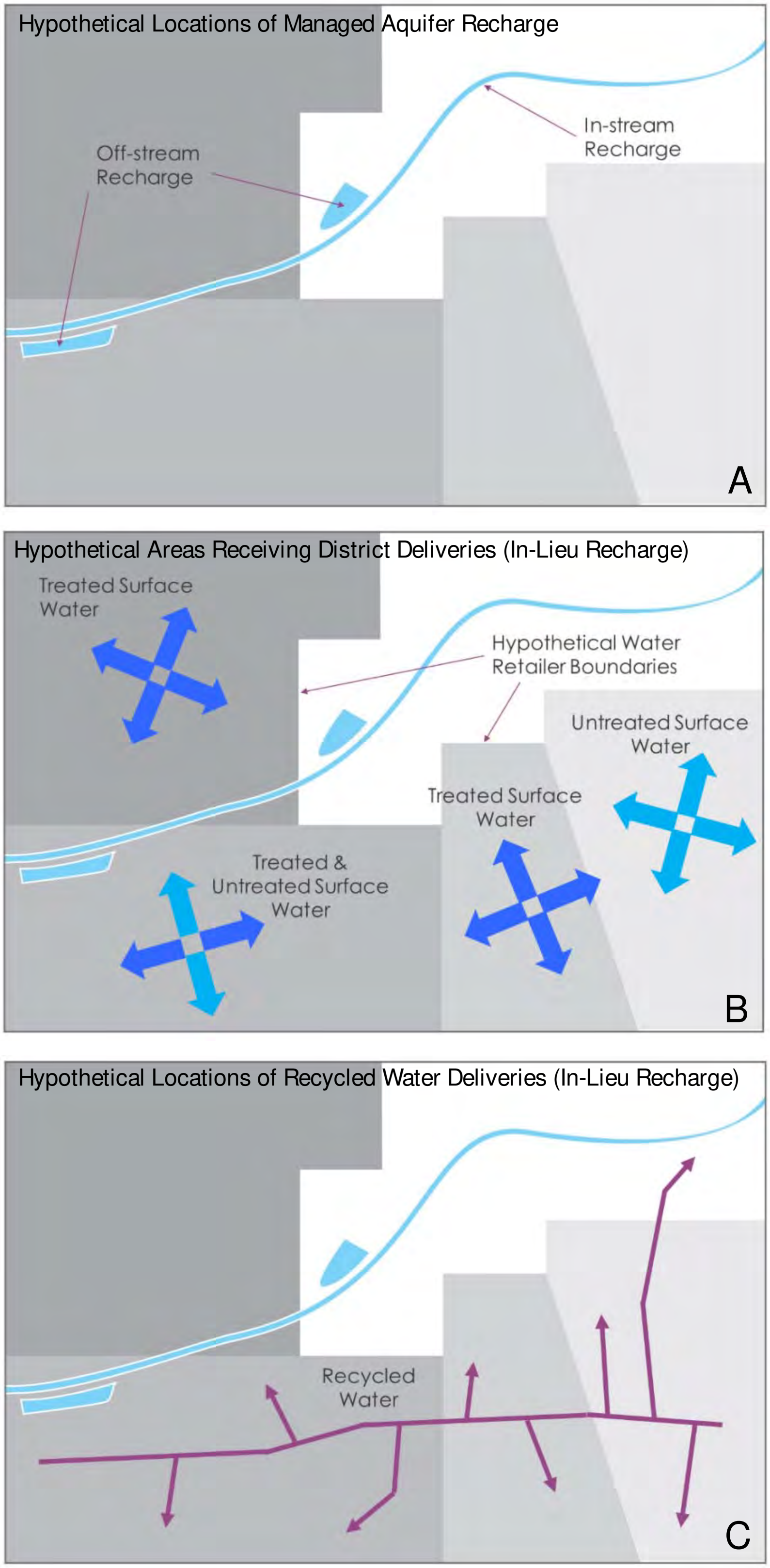

Hypothetical Locations of Managed Aquifer Recharge
Off-stream Recharge
In-stream Recharge
A
Hypothetical Areas Receiving District Deliveries (In-Lieu Recharge)
Treated Surface Water
Hypothetical Water Retailer Boundaries
Untreated Surface Water
Treated Surface Water
Treated & Untreated Surface Water
B
Hypothetical Locations of Recycled Water Deliveries (In-Lieu Recharge)
Recycled Water
C

Figure 6: District Activities Mapping Methodology

In-Lieu Recharge Activities

Deliveries of treated water that provide in-lieu recharge benefits to groundwater users will be mapped to correspond to the service area boundaries of the retailers that receive District water supplies (Figure 6B). If a retailer delivers specific District supplies to distinct areas, those distinct areas will be mapped. Deliveries of surface water to non-retailer users will also be mapped. More detailed mapping than retailer service areas will be required to distinguish areas within a retailer boundary that receive different water sources. For example, an area receiving raw surface water from the District would be distinguished from an area receiving treated surface water from the District. GIS data provided by the District, retailers, and California Public Utilities Commission (PUC) will be used to provide these boundaries. Groundwater users in the areas receiving deliveries of District treated, raw, and recycled water are benefitting from in-lieu recharge provided by the District supplies. In addition, benefits from in-lieu recharge also extend beyond the delivery area.

In order to identify areas where groundwater users benefit from District delivery of raw and treated surface water, the volumes of District water supplies over time to each area will be charted using data from the District. These volumes over time represent changes in District supplies that can be associated with groundwater benefits. When data or estimates for recharge volumes are not available for deliveries, periods when deliveries increased or decreased can be identified based on qualitative information such as the availability of imported water to deliver.

Areas receiving recycled water will also be mapped based on GIS data provided by the District (Figure 6C). As with surface water benefits, recycled water benefits extend beyond the areas of direct delivery. To evaluate the extent of the area receiving in-lieu benefits, as discussed below, deliveries of recycled water to various areas will be charted over time using data from the District.

Based on the availability of data, these charts may be limited to indicating when deliveries increased or decreased based on qualitative information about the recycled water program. Historically, the areas receiving recycled water have been smaller than areas receiving raw or treated surface water and the volumes of water were smaller, which may make it difficult to distinguish between in-lieu benefits from recycled water and raw and treated surface water. Therefore, areas receiving recycled water located within areas receiving raw or treated surface water will be grouped within the larger area receiving in-lieu benefits from raw or treated surface water deliveries. Areas receiving recycled water that are outside of areas receiving raw or treated surface water may provide in-lieu benefits that do not overlap areas with in-lieu benefits from raw or treated surface water deliveries.

Water conservation provides benefits to groundwater users resulting from in-lieu recharge facilitated by the reduced demand. These are broad benefits throughout the groundwater basins. Areas that benefit from managed aquifer recharge and other in-lieu recharge activities are also assumed to benefit from water conservation activities. However, to assist in identifying zones of benefit, areas where conservation activities occur will be mapped based on information from the District.

Groundwater Protection Activities

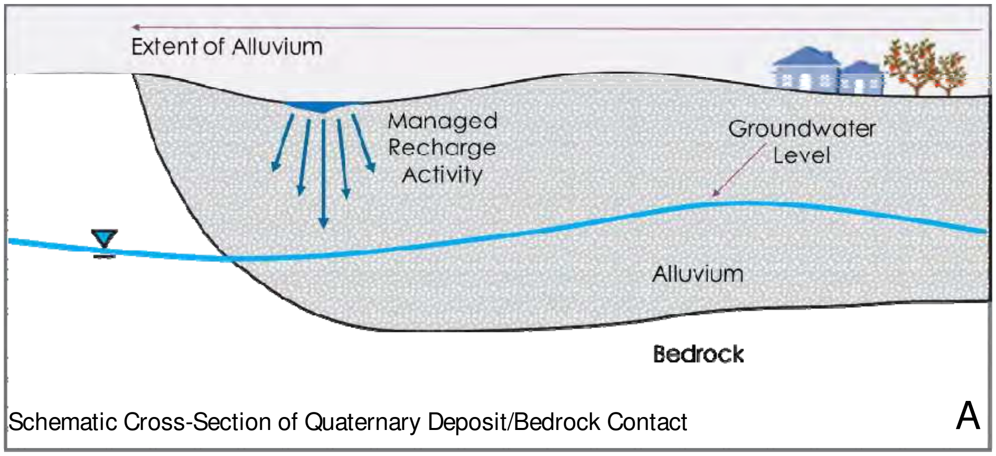
Groundwater protection activities provide broad benefits to groundwater quality throughout the groundwater basins. Areas that benefit from managed aquifer recharge and in-lieu recharge activities are also assumed to benefit from the groundwater protection activities. Similar to the approach to be used for water conservation activities, groundwater protection activities will be summarized and mapped based on information from the District to assist with identifying zones of benefit.

DEFINE HYDROGEOLOGICALLY CONNECTED AREAS BASED ON HYDROGEOLOGIC FEATURES

As discussed previously, District activities provide groundwater benefits beyond the immediate location of an activity. Groundwater flow patterns control how benefits extend beyond the activity locations. Several hydrogeologic features affect groundwater flow and will be mapped to define areas hydrogeologically connected to District activities. The planned features to be mapped are the contact between water-bearing sediments and bedrock and the location of groundwater divides and faults. These features will provide the boundaries for the hydrogeologically connected areas.

Mapping Water-Bearing Sediments

Quaternary deposits are mostly alluvium that provide the highest permeability for groundwater flow and therefore the greatest potential for connecting areas with groundwater users to benefits from District activities. Quaternary deposits mapped at the surface that are not specifically labeled alluvium are included because they are relatively young deposits and are relatively permeable compared to the older bedrock that bounds the basin. Bedrock has much lower overall permeability for groundwater flow and groundwater flow typically occurs in fractures that have not been mapped. Therefore, the Quaternary deposit/bedrock contact (Figure 7A) will define the hydrogeologically connected areas used to define the extent of potential benefit.


Extent of Alluvium
Managed Recharge Activity
Groundwater Level
Alluvium
Bedrock
Schematic Cross-Section of Quaternary Deposit/Bedrock Contact
A

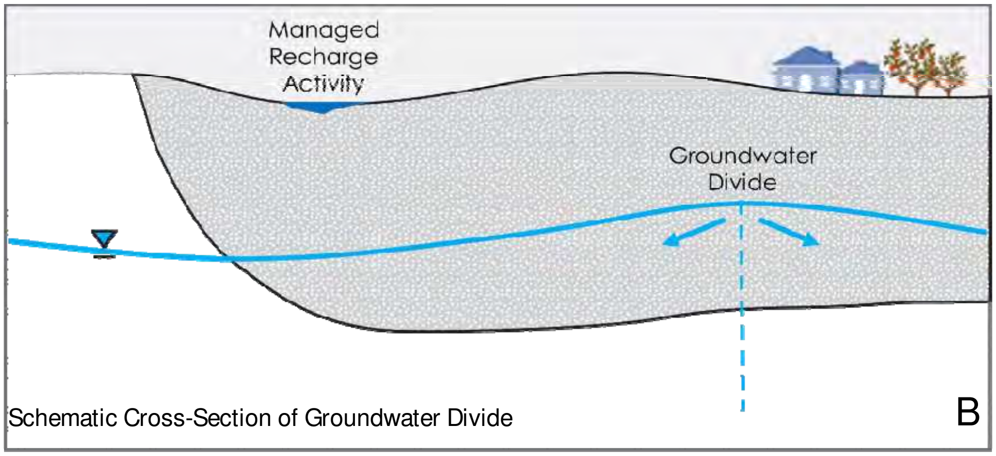

Managed Recharge Activity
Groundwater Divide
Schematic Cross-Section of Groundwater Divide
B

Figure 7: Schematic Cross-Sections

The Quaternary deposit/bedrock contact will be based on existing sources, such as mapping by the U.S. Geological Survey and California Geological Survey, including but not limited to *Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California* (Witter et al., 2006) and *Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine County San Francisco Bay Region, California* (Knudsen et al., 2000). GIS formats of these maps are available for use in this study.

Available basin wide information on the thickness of the Quaternary deposits and stratigraphy of the deposits will also be mapped. Large changes in thickness or stratigraphy could be geologic features that affect how groundwater flows between areas. One source that will be considered is *Physical Subdivision and Water-Bearing Sediments of the Santa Clara Valley, California* (Wentworth et al., 2015). These maps only cover North County.

Groundwater Divides and Faults

A groundwater divide occurs where there is a regionally high groundwater level and groundwater flows in opposite directions on either side of the divide (Figure 7B). Groundwater benefits are unlikely to extend from a District activity on one side of the divide to the other side of the divide unless the activity provides a large enough change to groundwater levels or is close enough to the divide to actually alter the divide's location. Groundwater divides can change over time, so groundwater divides over different years will be mapped to the extent possible. Available District groundwater level contour maps will be evaluated to identify the groundwater level contours that represent a divide. One of the main groundwater divides of interest is expected to be in South County between the Coyote Valley and Llagas Subbasin. California Department of Water Resources defines the northern boundary of the Llagas Subbasin based on the groundwater divide near Cochrane Road in Morgan Hill (DWR, 2004).

Faults can be barriers to groundwater flow. However, faults are not expected to be significant barriers to flow that define the extent of benefits in the District. Nonetheless, faults will be mapped and groundwater flow in the vicinity of faults will be evaluated . The initial evaluation will compare mapped faults with the contour maps. Faults identified as barriers to groundwater flow will be considered when identifying areas with improved groundwater levels as discussed below. The U.S. Geological Survey and California Geological Survey (2010) have developed fault maps in GIS format, which will be used for this purpose.

PLOT WATER BUDGET OVER TIME IN HYDROGEOLOGICALLY CONNECTED AREAS

In order to summarize the benefit of District activities in hydrogeologically connected areas, the water budget in each area will be plotted over time. The plots will show the effect of District activities on the water budget for the hydrogeologically connected area. Estimated volumes for different categories of District activities shown in
Figure 3 that result in managed aquifer and in-lieu recharge will be included along with estimates of outflows such as pumping. There may not be data or published estimates for volumes of groundwater inflows and outflows for historical periods, but the plots will represent and document the conceptual water budget for these periods given available information. These plots will provide background for how District activities improve conditions for the shared groundwater resource defined by each hydrogeologically connected area.

EVALUATE AREAS WHERE GROUNDWATER USERS BENEFIT FROM SPECIFIC DISTRICT ACTIVITIES

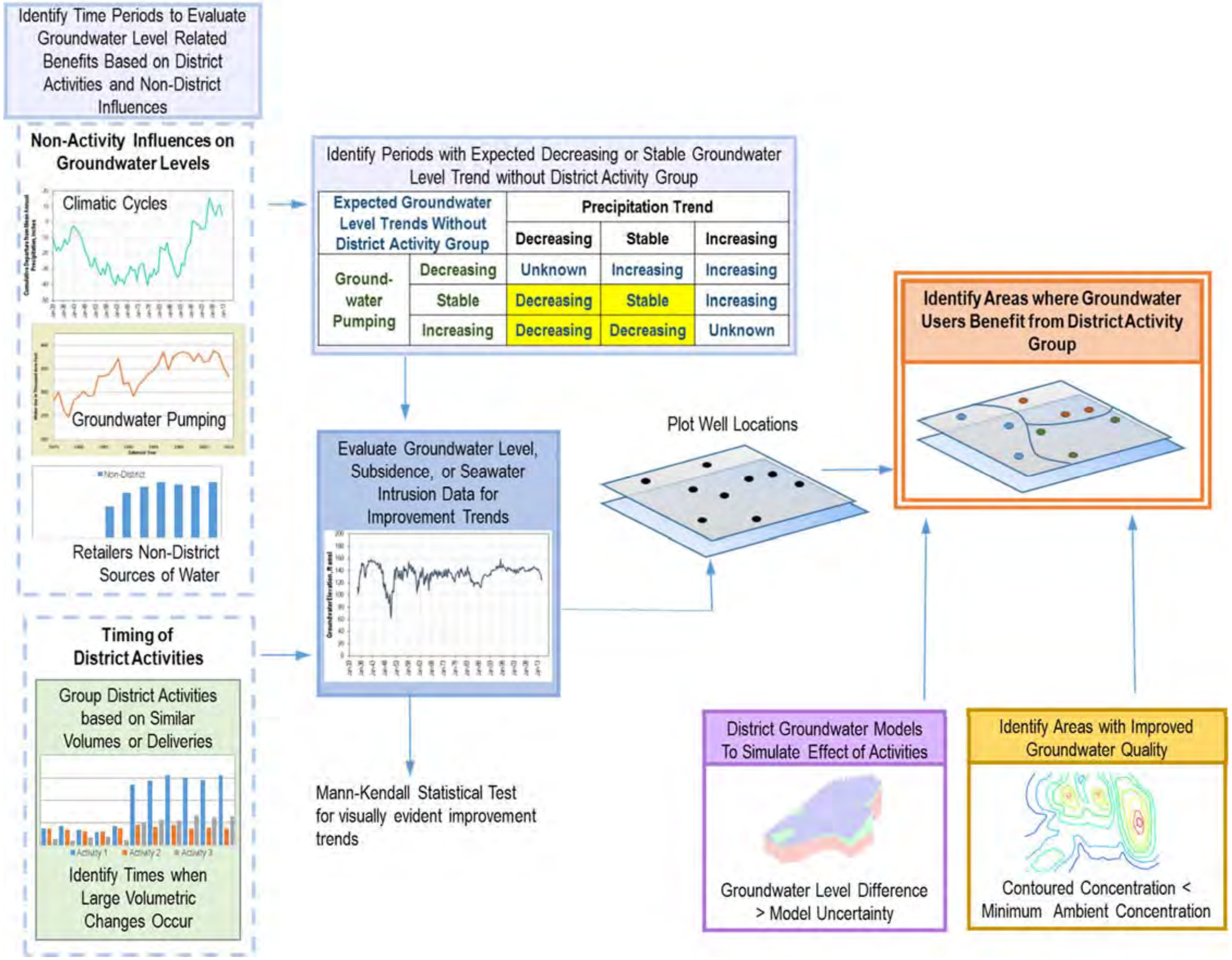
The evaluation of where groundwater users benefit from specific District activities will consider multiple lines of evidence. The lines of evidence can be grouped as follows:

1. Data demonstrating benefits derived from improved groundwater levels associated with District activities. In addition to groundwater level data, this includes the evaluation of land subsidence and saltwater intrusion data.
2. Groundwater model results demonstrating improved groundwater levels as a result of current or future District activities.
3. Data demonstrating improved groundwater quality associated with District managed aquifer recharge.

All available information from these lines of evidence will be considered in identifying areas benefitting from specific District activities. Figure 8 summarizes the use of the three lines of evidence. If any of the lines of evidence demonstrate that groundwater users in an area benefit from a set of District activities, then the area will be mapped as benefitting from that set of District activities. Additional lines of evidence and alternate methods of evaluating information may be considered as new information become available and data are compiled. Any changes to methodology will be fully documented.

Evaluation of Data Related to Improved Groundwater Levels

This line of evidence is based on an evaluation of groundwater levels, land subsidence, and saltwater intrusion data. If data show groundwater levels, land subsidence, and saltwater intrusion in an area have improved or stabilized as a result of a District activity, then groundwater users in the area are benefitting from that activity. Historically, the District has implemented its activities to mitigate chronic overdraft that was causing undesirable effects such as declining groundwater levels, subsidence and saltwater intrusion. Therefore, the analyses will find a beneficial improvement whenever District activities result in any rise or stabilization of groundwater levels or prevention of the undesirable effects associated with declining groundwater levels. These groundwater level analyses are summarized in Figure 8 and described in greater detail below. The analysis as applied to groundwater level data is described immediately below. Discussion of specific differences in the analyses of land subsidence and saltwater intrusion data from the evaluation of groundwater level data follows.


Identify Time Periods to Evaluate Groundwater Level Related Benefits Based on District Activities and Non-District Influences
Non-Activity Influences on Groundwater Levels
Climatic Cycles
Groundwater Pumping
Non-District
Retailers Non-District Sources of Water
Timing of District Activities
Group District Activities based on Similar Volumes or Deliveries
Activity 1
Activity 2
Activity 3
Identify Times when Large Volumetric Changes Occur
Identify Periods with Expected Decreasing or Stable Groundwater Level Trend without District Activity Group
Evaluate Groundwater Level, Subsidence, or Seawater Intrusion Data for Improvement Trends
Mann-Kendall Statistical Test for visually evident improvement trends
Plot Well Locations
Identify Areas where Groundwater Users Benefit from District Activity Group
District Groundwater Models To Simulate Effect of Activities
Groundwater Level Difference > Model Uncertainty
Identify Areas with Improved Groundwater Quality
Contoured Concentration < Minimum Ambient Concentration

Expected Groundwater Level Trends Without District Activity Group		Precipitation Trend		
		Decreasing	Stable	Increasing
Groundwater Pumping	Decreasing	Unknown	Increasing	Increasing
	Stable	Decreasing	Stable	Increasing
	Increasing	Decreasing	Decreasing	Unknown

Figure 8. Flow Chart for Identifying Areas where Groundwater Users Benefit from Improved Groundwater Conditions

Analysis Applied to Groundwater Level Data

Groundwater level improvements associated with District activities will first be evaluated based on trends in groundwater level observation data at wells throughout the District. As described above, there are two main categories of District activities providing groundwater level improvement benefits: managed recharge and in-lieu recharge. In-lieu recharge encompasses a number of types of activities providing in-lieu recharge: treated water delivery, untreated surface water delivery, recycled water delivery, and conservation. The purpose of this analysis is to identify groundwater level improvements associated with specific groups of District activities. The steps for this analysis will be as follows:

1. Group District activities based on category, type, location and similar volumetric recharge or deliveries over time. This grouping will be based on the most reliable information available.
2. Identify time periods when volumetric recharge or deliveries increase for each group of activities from step #1. As in step #1, time periods will be identified based on the most reliable information available.
3. In order to evaluate the influence of each group of District activities on groundwater levels, evaluate influences on groundwater levels (as described below) that are unrelated to the group of District activities being evaluated (hereafter also referred to as "the District activity group") over each time period identified for the District activity group in step #2. These influences may be hydrologic conditions, non-District activities, or other District activities[1] not in the District activity group. Based on the evaluation of these influences, identify whether the expected groundwater level trend without the District activity group would be decreasing, stable, or increasing over each time period.
4. If the expected groundwater level trend without the District activity group , as defined in step #3, is decreasing or stable, evaluate whether the groundwater level trend in wells throughout the District show an improvement compared to the expected trend over the identified time period. Although periods will not be evaluated when there is an expected increasing groundwater level trend even

---

[1] Evaluating influences from other District activities has been added to the methodology since draft methodology was shared with stakeholders. This will facilitate evaluating benefits from District managed recharge in areas that receive District in-lieu recharge supplies. As a result, we are evaluating groundwater pumping for an area instead of non-District net demand as described in draft methodology.

> without the District activity group , any demonstrated benefit from District activities for the area would still occur during those periods.

When volumetric recharge or deliveries increase over time from a District activity group (steps #1 and #2), groundwater levels should improve or stabilize in the areas with groundwater users receiving a benefit from the District activity. Time periods of increasing volumes will typically be associated with a new source of water coming online. The groundwater level trend at wells will be evaluated over each time period with increased volumes to assess whether an area's groundwater users are receiving a benefit from the District activity.

The evaluation of hydrographs will also consider other influences on groundwater levels over the time periods identified in steps #1 and #2 that are unrelated to the District activity group, such as changing climatic cycles, water demand, and water suppliers' sources of water. The effect of these other influences on the water balance will be evaluated to identify the expected groundwater level trend without the District activity (step #3).

Changing climatic cycles will be represented by charting the departure of mean annual precipitation from the mean precipitation measured at the nearest gauge with valid data. Historic long-term precipitation data from the ALERT hydrologic data collection system within or close to the groundwater basins will be used. The data from the most-representative station or stations for an area will be used for evaluating the climatic cycle. Figure 9 shows an example mean annual precipitation departure curve with periods of different precipitation trends. If groundwater levels responded only to climatic change, the expected groundwater level trend would be decreasing between 1942 and 1955 based on the decreasing precipitation trend. The expected groundwater level trend would be increasing between 1992 and 2005 based on the increasing precipitation trend. Although any benefit from a District activity would still be occurring, we will not be able to distinguish a groundwater benefit from District activities based on increasing groundwater levels during a period of increasing precipitation.

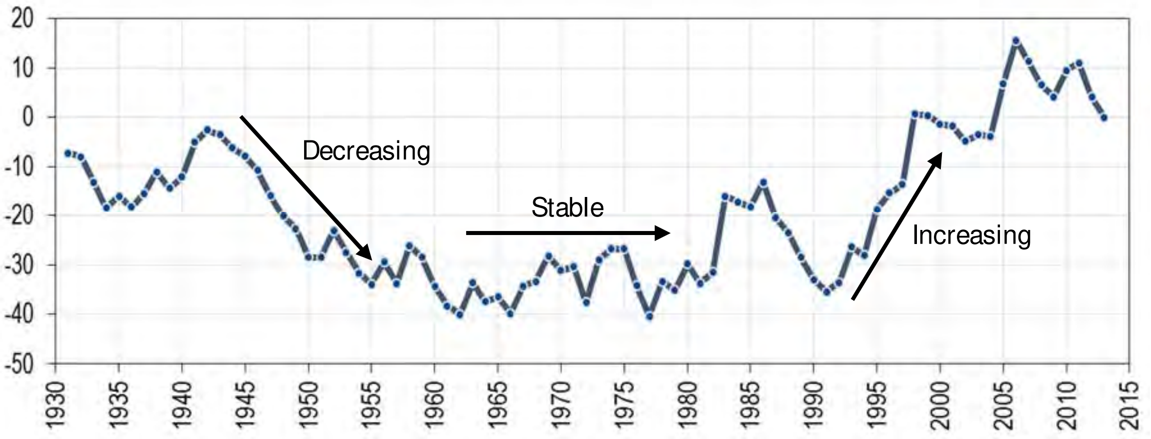


Figure 9: Example of Cumulative Departure from Mean Annual Precipitation

There are instances where water suppliers provide water sources other than groundwater, which for this study is referred to as in-lieu water supply. Groundwater pumping represents the expected influence of each water supplier's in-lieu water supplies on groundwater levels. In-lieu water supplies reduce groundwater pumping, and groundwater pumping has an inverse relationship to expected groundwater trends. Groundwater pumping will be evaluated for each water supplier's service area receiving a specific set of in-lieu water supplies. We expect a trend of decreasing groundwater levels when groundwater pumping increases within a water supplier's service area. We expect a trend of increasing groundwater levels when groundwater pumping decreases within a water supplier's service area.[2] This evaluation identifies periods when benefits from either a managed recharge or in-lieu District activity group cannot be identified due to non-District in-lieu water supplies. This evaluation also identifies periods when benefits from a managed recharge District activity group cannot be distinguished from District in-lieu recharge activities. In either of these cases, those periods will not be evaluated.

During periods of decreasing groundwater pumping, water budget information will be evaluated to assess whether the District's conservation activities may have resulted in decreasing groundwater pumping. If so, increasing groundwater levels during such a period would further demonstrate benefit from District conservation activities, but would be unable to demonstrate benefit from the District's other recharge activities.

---

[2] In order to account for non-District in-lieu recharge activities, groundwater pumping is equivalent to non-District net demand concept discussed in draft methodology shared with stakeholders.

Land use changes can also alter water demand. The study will include a high level description of land use changes that have impacted demand, and such changes will not be attributed to District activities.

Table 1 shows the nine potential combinations of precipitation trends and groundwater pumping trends and the expected groundwater level trends without the District activity group based on those combinations. In order to identify groundwater benefits from District activities other than conservation, groundwater level trends will be evaluated when the expected trend is stable or decreasing. The four expected scenarios that result in stable or decreasing groundwater level trends are shown in grey boxes on Table 1. These expected groundwater level trends can be compared to observed groundwater level trends to identify benefits from District activities.

Based on this analysis, a benefit from the District activity group will be demonstrated when:

- the expected groundwater level trend without the District activity group is decreasing and observed groundwater level trends are stable or increasing
- the expected groundwater level trend without the District activity group is stable and the observed groundwater level trend is increasing

If the expected groundwater level trend without the District activity group is unknown or increasing, there will not be enough information to determine the benefits from District activities. However, a benefit from the District activity group as demonstrated during other periods would still occur during these periods.

Table 1: Expected Groundwater Level Trend Based on Precipitation and Groundwater Pumping (Without the District Activity Group)

Expected Groundwater Level Trend Without the District Activity Group		**Precipitation Trend**		
		Decreasing	**Stable**	**Increasing**
Groundwater Pumping	**Decreasing**	Unknown	Increasing	Increasing
	Stable	Decreasing	Stable	Increasing
	Increasing	Decreasing	Decreasing	Unknown

Groundwater level hydrographs will be evaluated for a trend that demonstrates a groundwater level improvement compared to the expected trend and therefore a benefit to groundwater users in the area from the District activity (step #4). The groundwater level trend demonstrating improvement will need to be visually evident in the hydrograph over the period of increased volumes by the District activity as identified in step #2. A single period that shows groundwater level improvement from the District activity demonstrates benefit to groundwater users in the area because the benefits may be masked for periods where other influences evaluated in step #3 prevent identification of improvements from District activities. Figure 10 shows an example hydrograph with periods of increased volumes by District activities annotated based on new water sources being secured by the District. Note that the increasing trend in the late 1930s would likely not be used to demonstrate benefit based on groundwater level data because precipitation increased during that time (Figure 9) while the stable trend in the 1950s would be used to demonstrate benefit because precipitation was stable and demand increased.

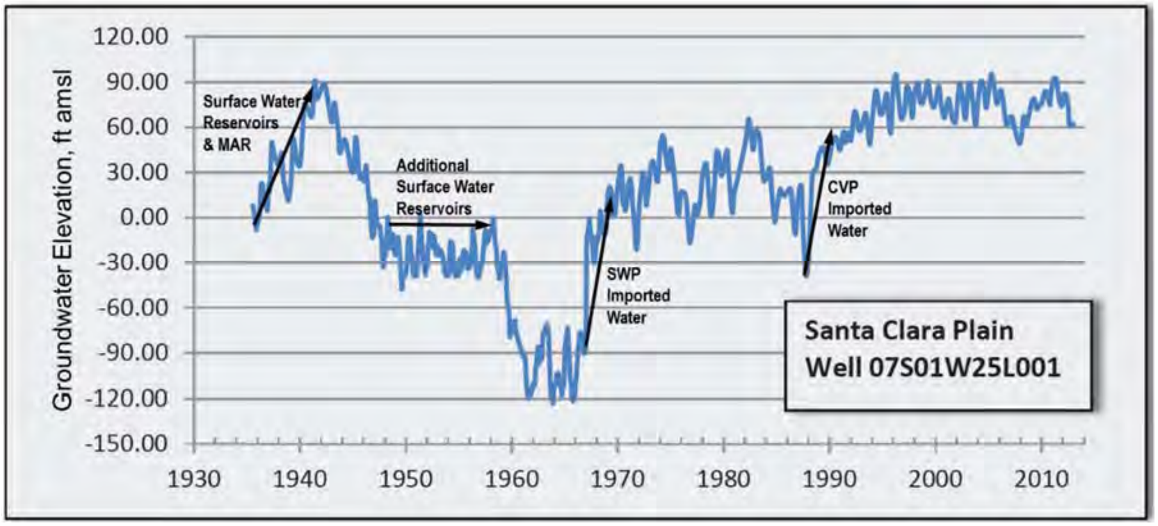


Figure 10: Groundwater Level Responses to District Activities

In order to quantify the statistical significance of the visually evident groundwater level trend demonstrating improvement, a Mann-Kendall test will be performed for data over the time period when a trend demonstrates improvement. The Mann-Kendall test is appropriate because it is non-parametric and does not rely on the distribution of the data set (Heisel and Hirsch, 2002). If data show regular seasonal variation, the seasonal Kendall test will be performed to calculate the probability that the visually evident trend is false.

If groundwater level data from a well demonstrates a benefit from a set of District activities for any time period, the map of benefits to groundwater users from that set of District activities will extend to the hydrogeologically connected area around the well.

Data used for the hydrograph analyses will be from the District's monitoring well network, and from water suppliers and stakeholders, as available. Data being considered for use will be evaluated to verify adequate measurement protocol and ensure there are sufficient regularly measured static groundwater levels to evaluate trends during times of increased volumes from District activity (step #2). Stakeholders should submit all information about the well such as a well log and construction information.

Available data for individual wells will be evaluated to ensure the wells are representative of aquifer conditions. Criteria that will be used to evaluate which individual wells will be used in the analysis include, but are not limited to:

- Well construction information, such as well depth, screened intervals, and lithology
- Period/frequency of water level measurements
- Completeness of water level records

Stakeholders are also encouraged to provide any other information, including data related to the calculation of groundwater pumping and non-District recharge activities, that they wish the study to consider. For example, information about non-District recharge activities would be evaluated using a similar procedure to District managed recharge activities. Hydrographs for wells near a non-District recharge activity would be compared to the non-District recharge quantities over time as well as District activity quantities over time to assess whether groundwater level improvements at those wells can be associated with District activities and are not solely a result of the non-District recharge activity.

Analysis of Land Subsidence Data

Improved groundwater levels are the mechanism by which land subsidence has been halted and prevented. However, land subsidence data will also be useful for evaluating benefit from District activities to groundwater users. Subsidence data will be evaluated from locations where land subsidence has occurred since 1915. Data to be evaluated includes key benchmark ground surface elevations and extensometer measurements. The expected trend without District activities given the historical subsidence at the location is continued lowering of the ground surface. If data show subsidence stops occurring after groundwater volumes increase from a set of District activities, a benefit to groundwater users in the area is demonstrated.

Analysis of Saltwater Intrusion Data

Similar to land subsidence, improved groundwater levels are the mechanism by which saltwater intrusion has been halted or reversed. Likewise, saltwater intrusion data will also be useful for evaluating benefit from District activities to groundwater users. Saltwater intrusion data represented by chloride concentrations will be evaluated from wells along the San Francisco Bay where concentrations increased above 100 mg/L after 1945. The trend in chloride concentrations over and after periods of increased water volumes from District activities will be evaluated using similar methodology to trends in groundwater levels. Trends at monitoring locations may not follow the same time periods because the effect of improved groundwater levels on saltwater intrusion may be delayed. The expected trend without District activities given the historical saltwater intrusion at the location is continued saltwater intrusion or increasing chloride concentrations. If chloride concentration data show a trend of stable or decreasing concentrations after groundwater volumes increase from a set of District activities, a benefit to groundwater users in the area is demonstrated.

Groundwater Model Simulations

Results from groundwater model simulations will be a second and equivalent line of evidence evaluated for the effect of District activities in different areas. The simulated data will be generated using calibrated District groundwater flow models for the Santa Clara Plain, Coyote Valley, and Llagas Subbasin.

Evaluating whether groundwater levels improve from District activities will be performed by comparing simulations of conditions with and without District activities. Therefore, the modeling will evaluate the same sets of District activities evaluated in the groundwater level analysis.

District activities for managed aquifer recharge are simulated in various ways in the models and reduced recharge volumes will simulated accordingly. Reduced volumes of deliveries for in-lieu recharge will be simulated as increased pumping in the models. Complete removal of managed aquifer recharge and/or delivered water for any set of District activities may alter the water balance so drastically that the basin completely dries out in the model so alternatives such as partial reductions in recharge volumes may be used for the model to provide meaningful results that can be used to evaluate the effect of District activities.

Groundwater levels simulated with District activities removed or reduced will be subtracted from groundwater levels simulated with actual historical conditions. The average difference in groundwater levels will be calculated over the modeled time period of the set of District activities. The map of the average differences will show where groundwater levels improve and benefits occur. All models have some uncertainty, and we will ensure that the benefits we identify in the model are the result of District activities, and not model uncertainty.

If results from model simulations using the Santa Clara model evaluating indirect potable reuse are available, results showing benefit from the planned recharge of purified water will be used in the evaluation.

Identifying Areas with Improved Groundwater Quality

The first step in identifying areas with improved groundwater quality as a result of District activities is identifying key constituents that differentiate ambient groundwater from recharge water. Possible constituents include total dissolved solids and nitrates. For each of these constituents, the expected range of concentrations will be estimated for ambient groundwater and recharge water. Contours of current groundwater quality will be developed around recharge streams and ponds for identified constituents using data from monitoring wells sampled by the District. Contours of concentrations below the low end of concentrations expected for ambient groundwater will define the area with improved groundwater quality and therefore benefits from the managed aquifer recharge. Isotopic analysis that differentiate ambient groundwater from recharge water will also be considered. These data were collected by the GAMA program (Ray, 2009) and as part of the Olin remediation project (MACTEC, 2009).

PROPOSING ZONES OF BENEFIT

Zones of benefit will be proposed based on the analyses described above that provides maps illustrating where groundwater users are benefiting from District activities. Zones will be proposed for areas receiving benefits from similar sets of District activities.

SUMMARY

District activities provide benefits to groundwater users through managed aquifer recharge, in-lieu recharge, and groundwater protection. A methodology has been outlined that defines the areas hydrogeologically connected to District activities. Then, available data and groundwater model simulations will be evaluated to identify the benefits from all District activities in the area. Zones of benefit will be defined based on areas receiving benefits from similar sets of District activities.

REFERENCES

California Department of Water Resources, 2004, *California's Groundwater Bulletin 118: Central Coast Hydrologic Region, Gilroy-Hollister Groundwater Basin, Llagas Subbasin*, http://www.water.ca.gov/groundwater/bulletin118/basindescriptions/3-03.01.pdf, last updated February 27.

California Department of Water Resources, 2004, *California's Groundwater Bulletin 118: San Francisco Bay Hydrologic Region, Santa Clara Valley Groundwater Basin, Santa Clara Subbasin*, http://www.water.ca.gov/groundwater/bulletin118/basindescriptions/2-09.02.pdf, last updated February 27.

Heisel, D.R. and R.M Hirsch, 2002, *Statistical Methods in Water Resources*, Techniques of Water Resources Investigations of the United States Geological Survey, Book 4 Chapter A3, September.

Knudsen, K.L., J.M. Sowers, R.C. Witter, C.M. Wentworth, and E.J. Heller, 2000, *Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine County San Francisco Bay Region, California*, U.S. Geological Survey Open-File Report 00-444 Online version 1.0

MACTEC Engineering and Consulting, Inc. (MACTEC), 2009, *Llagas Subbasin Characterization -2008: Santa Clara County Olin/Standard Fusee Morgan Hill, California*, prepared for Olin Corporation, January 30.

Ray, M.C., J.T. Kulongoski, and K. Belitz, 2009, *Ground-water quality data in the San Francisco Bay study unit, 2007: Results from the California GAMA program*, U.S. Geological Survey Data Series 396.

Santa Clara Valley Water District (SCVWD), 2014, *FY 2014-15 Protection and Augmentation of Water Supplies*, February.

U.S. Geological Survey and California Geological Survey, 2010, *Quaternary fault and fold database for the United States*, http//earthquakes.usgs.gov/hazards/qfaults/.

Wentworth, C.M., R.C. Jachens, R.A. Williams, J.C. Tinsley, and R.T. Hanson, 2015, *Physical Subdivision and Description of the Water-Bearing Sediments of the Santa Clara Valley, California*, U.S. Geological Survey Scientific Investigations Report 2015-5017, April 6.

Witter, R.C., K.L. Knudsen, J.M. Sowers, C.M. Wentworth, R.D. Koehler, and C.E. Randolph, 2006, *Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California*, U.S. Geological Survey Open File Report 2006-1037 Version 1.1.

Page intentionally left blank

APPENDIX A: EVALUATION OF METHODOLOGIES USED TO ESTABLISH GROUNDWATER ZONES OF BENEFIT IN CALIFORNIA

Historically, California water agencies have been limited in their ability to establish groundwater zones of benefit as a means for funding projects and programs. Statutes creating agencies to manage groundwater (such as the Santa Clara Valley Water District Act) as well as other special act districts providing water related services (e.g. Coachella Valley Water District, Monterey County Water Resources Agency, and San Benito County Water District) have various provisions related to creating charge zones. Water conservation districts formed under Water Code Division 21, and agencies providing groundwater management under AB3030 (Water Code Sections 10754 *et. seq.)* are legislatively authorized to form zones of benefit and assess charges to groundwater users to recover the cost of district activities that benefit the groundwater resource. At the request of Santa Clara Valley Water District, HydroMetrics WRI has researched current groundwater zones of benefit and the methodologies used to establish multiple zones within a single agency's jurisdiction.

The initial agencies to review for methodologies establishing groundwater zones of benefit were identified from a paper on funding sustainable groundwater management in California posted by the UC Davis Center for Watershed Sciences (Hanak et al., 2014). The UC Davis paper includes a chart prepared by the Public Policy Institute of California listing groundwater pumping charges in special act districts as of 2013/2014. Of the 15 agencies created by statute to manage groundwater, the authors found evidence that only five of those agencies charge pumping fees, including Santa Clara Valley Water District[3]. Of the remaining four, only Pajaro Valley Water Management Agency assesses charges depending on pumping location, thereby establishing different charge zones. The paper also notes that, according to the DWR Bulletin 118 2003 update, none of the AB 3030 agencies was known to have exercised its authority to enact groundwater pumping charges through the creation of groundwater replenishment districts. Five additional agencies with multiple charge zones were identified through personal knowledge and research. These are the special act districts of Coachella Valley Water District, Monterey County Water Resources Agency (Salinas Valley Basin), and San Benito County Water District, and the water conservation districts of Santa Ynez

---

[3] It is worth noting that the activities performed by these agencies to manage groundwater range considerably. In previous research, HydroMetrics WRI could not find any evidence that four of the listed agencies are functioning and three others do not appear to have active groundwater restoration programs.

River Water Conservation District and United Water Conservation District. The methodologies used by the six identified agencies to establish multiple zones of benefit are summarized below.

COACHELLA VALLEY WATER DISTRICT (CVWD)

The CVWD has three zones of benefit. Initially, there were two zones with boundaries corresponding to DWR subbasins. A USGS study indicated a clay aquitard within the Whitewater River subbasin, which resulted in CVWD sub-dividing that zone of benefit into two. No further analysis of the zone boundaries has been conducted, although CVWD is reconsidering restoring the Whitewater River subbasin as a single zone. The CVWD District Act limits zone charges to benefits from imported water used for direct groundwater recharge and in-lieu recharge from use of recycled water (Reyburn, 2015).

PAJARO VALLEY WATER MANAGEMENT AGENCY (PVWMA)

The PVWMA Agency Act provides for creating zones of benefit for areas within PVWMA’s jurisdiction that will benefit from planning, studies, or any management program undertaken by PVWMA in a manner different from other areas within the agency’s jurisdiction. Zones of benefit are established by a resolution of the board that describes the boundaries of the zones and may only be adopted following a noticed public hearing.

Two zones were established in 2010 based on delivered water (Carollo, 2010). Parcels along the coast with access to water delivered through PVWMA’s coastal distribution system are in the Delivered Water Zone. All other parcels within PVWMA’s boundaries are in the Outside Delivered Water Zone. In arriving at the current zone determination, several options were considered including geographic segmentation using 1/2 mile contours, hydrogeologic segmentation based on seawater intrusion, and zone of service segmentation based on availability of delivered water. The adopted variation in zone definition was intended to recognize that the water users closer to the coast benefit more (receive greater service) from PVWMA’s system than inland water users.

MONTEREY COUNTY WATER RESOURCES AGENCY (SALINAS VALLEY BASIN) (MCWRA)

The Salinas Valley Basin zone of benefit has been defined based on geological conditions and hydrologic factors, which define and limit the benefits derived from MCWRA’s reservoir operations. Historic work showed there to be five distinct sub-areas within the Salinas Valley Basin. Those sub-areas were first identified in DWR Bulletin 52, which established the division in accordance with sources of replenishment of groundwater for the respective areas served as indicated by direction of groundwater flow after the close of the 1944 irrigation season. Bulletin 52 emphasizes that these areas are not in any way to be confused with subbasins. This analysis resulted in the five original zones.

Historic work showed that each of the sub-areas within the Salinas Valley is hydraulically connected, but due to their varying geology and geography, they receive varying levels of benefits from the operation of the two existing reservoirs. Many of those same bodies of work have shown that the benefits that could be derived from proposed Salinas Valley Water Project facilities would also vary by geographic location within the Salinas Valley.

In 2001, a Technical Committee reviewed the sub-area delineations established in DWR Bulletin 52, and determined that there is information supporting those delineations and there is no known contradictory information. However, a review of the geology of the Salinas Valley indicates water-bearing alluvium extends south of the Upper Valley area, as delineated in DWR Bulletin 52, to beyond the Monterey/San Luis Obispo County line. This alluvium also extends west from the Salinas River area to the area surrounding San Antonio Reservoir. The original five sub-areas were, therefore, expanded to seven.

Prior to 2003, special benefit zones covering the Salinas Valley were known as: Zone 2 and 2A, which funded standby and availability charges associated with the operation and maintenance of existing facilities; and Zone 2B, which included approximately 12,800 acres of irrigated agricultural lands within the Castroville Seawater Intrusion Project (CSIP) distribution system. In 2003, Zone 2C was created and includes the lands that receive benefits from the Salinas Valley Water Project. Zone 2C overlays the previous Salinas Valley zones and was defined based on geological conditions and hydrologic factors, which define and limit the benefits derived from the reservoirs and the proposed changes to the operations, storage, and release of water from the reservoirs. Zone 2C is separated into the seven major hydrologic sub-areas described above.

The basis for inclusion within the Zone 2C zone of benefit consists of the following eight criteria reviewed and approved by the Technical Committee in 2001:

(a) There must be a hydro-geologic or flood protection basis for establishing benefit;

(b) The zone of hydrologic benefits is defined as land overlying water bearing alluvium that has hydraulic continuity with the Salinas River;

(c) The zone of benefit excludes narrow, likely shallow, channels off the main basin where pumping cannot induce an up-gradient recharge;

(d) Existing annexations that are non-hydraulically connected have been included since they are receiving benefits through physically installed pumping and piping equipment;

(e) The southern boundary of the zone of benefit is defined by the Monterey/San Luis Obispo County line;

(f) Lands immediately adjacent to San Antonio reservoir receive hydrologic benefits due to recharge of the underlying aquifer and receive recreational benefits afforded by their proximity to San Antonio reservoir;

(g) The boundary in the Fort Ord area is defined by the existing boundary of zone 2A. ;

(h) Any contiguous parcel that overlies a portion of the alluvial material that is in hydrologic continuity with the Salinas River has been included in a zone of benefit since the overlying portion of the parcel provides access to all hydrologic benefits (RMC, 2003).

Section 3.2.1 of the Salinas Valley Water Project Engineer's Report (RMC, 2003) describes the benefits and weighting factors assigned to each benefit in developing the Zone 2C charges. The benefits are identified as: (1) control of seawater intrusion; (2) flood control; (3) increased groundwater recharge; (4) groundwater quality; (5) timing and location of the recharge; (6) drought protection; (7) preservation of aquifer storage; and (8) recreation.

SAN BENITO COUNTY WATER DISTRICT (SBCWD)

SBCWD was formed by a special legislative Act in 1953. The original jurisdiction was valley-wide instead of county-wide. An early amendment to the Act, redefined the boundaries to be county-wide; however, taxing powers were limited to areas within zones of benefit. Five zones were created between 1953 and 1967 to fund specific projects. Only Zone 3 of those original five zones remains active. Zone 3 was formed in 1957 to finance construction and operation of the Hernandez and Paicines reservoirs and related groundwater recharge and management activities. The original Zone 1 practically overlapped with Zone 3 exactly and was dissolved. The other original zones were dissolved for the following reasons: the Zone 2 function was assumed by the Tri-County Water Authority; the Zone 4 function was turned over to the City of Hollister; and Zone 5 was temporary to finance engineering and hydrological studies to prepare development of facilities to distribute San Felipe water and was succeeded by the permanent operating Zone 6 (Creegan & D'Angelo-McCandless, 1977, pages I-2 – I-3).

The current Zone 1 encompasses the entire county and provides the funding base for specific SBCWD administrative expenses. The methodology used to define the Zone 3 boundaries could not be located. A master plan report prepared in 1977 by Creegan & D'Angelo-McCandless, Consulting Engineers, documents the formation of Zone 6, which establishes the assessment area for financing the capital and operating expenses of the San Felipe project (CVP). Zone 3 and Zone 6 overlap in areas that receive benefits from projects funded by the both zones.

The Zone 6 boundaries were determined primarily by land classifications within the area to receive CVP water. The foundation document for establishing the project benefit area was the U.S. Bureau of Reclamation's March, 1973, "Land Classification Appendix" for the Hollister Subarea, San Felipe Division, Central Valley Project. The Zone 6 area encompasses acreage referred to in the Land Classification Appendix as the Hollister Basin and San Juan Valley. Zone 6 boundary modifications were made in the above referenced master plan to eliminate non-irrigable lands in adjacent hills, for political considerations, and to observe parcel boundaries to simplify taxation.

SANTA YNEZ RIVER WATER CONSERVATION DISTRICT (SYRWCD)

SYRWCD was formed in 1939 for the primary purpose of protecting water rights on the lower Santa Ynez River following construction of two upstream reservoirs. Additional projects or exportation of water were also being studied, and the Cachuma Project was administratively authorized in the same year. For these reasons, the people of the Santa Ynez and Lompoc Valleys joined together to form a water conservation district. The purpose of SYRWCD is to protect, and if necessary, augment the water supplies of the SYRWCD. (Stetson Engineers, 2015). SYRWCD's role is essentially that of an oversight authority and it operates on a budget of approximately $500,000/year. Groundwater charges are incurred by the owners of water production facilities and are charged at uniform rates (for each category of water) within SYRWCD or each Zone thereof, based on the amount of groundwater produced (Wales, 2015).

There were three zones prior to 1995: the Santa Ynez River alluvial channel; the Lompoc Plain; and all others. In the course of preparing an AB3030 plan, SYRWCD convened a committee of five geologists who determined boundaries for three additional zones based on hydrogeological distinctions and groundwater recharge from the Santa Ynez River. While SYRWCD continues to be segregated into six zones, there are only two groundwater rate schedules: Zone A (Santa Ynez River alluvial channel), which accounts for 27% of the total groundwater pumping, and Zone B (Lompoc Plain, Lompoc Upland and Lompoc Terrace sub-basins), which accounts for 50% of the total groundwater pumping, are charged at a higher rate; Zones C, D, E, and F are charged a lower rate (Wales, 2015). Zone C encompasses all portions of the SYRWCD not included in the other zones, and Zones D, E, and F cover the SYRWCD's portion of three distinct upland basins.

UNITED WATER CONSERVATION DISTRICT

United Water Conservation District (UCWD) has established two zones. Zone A includes all lands lying within the boundaries of UWCD. Zone B was formed to pay for operation and maintenance of, and any improvements to, the Freeman Diversion project facilities. Zone B is a sub-area of Zone A that encompasses the portions within the UWCD boundaries of all DWR defined basins or subbasins down gradient of the diversion project. Since 2012, two of these basins have been re-labeled (Montalvo is now referred to as Oxnard Forebay; and North Las Posas is now referred to as West Los Posas), but the zone boundaries have not been re-evaluated (Morgan, 2015).

REFERENCES

Coachella Valley Water District, 2015, District Website http://www.cvwd.org/200/Replenishment-Assessment-Charge , accessed June 2, 2015.

Carollo Engineers. 2010. Pajaro Valley Water Management Agency – Proposition 218 Service Charge Report Phase 1/ Technical Memorandum Recommended Rate Recovery Methodology http://tinyurl.com/nvyrvyc

Creegan & D'Angelo-McCandless, Consulting Engineers. 1977. San Benito County Water Conservation and Flood Control District Draft Master Plan Report for Public Law 130 – Loan Application and Formation of Zone 6 – Benefit Area. San Felipe Project, July 1977.

DWR Bulletin 52. 1946. Salinas Basin Investigation Summary Report. http://www.water.ca.gov/waterdatalibrary/docs/historic/Bulletins/Bulletin_52/Bulletin_52-B__1946.pdf

Hanak, E., et al. 2014. Funding sustainable groundwater management in California. California Water Blog by the UC Davis Center for Watershed Sciences, April 3, 2014. http://tinyurl.com/m7wea6y

Monterey County Water Resources Agency Act. http://www.mcwra.co.monterey.ca.us/about/documents/MCWRA%20Agency%20Act.pdf

Morgan, Tony. 2015. Personal Communication, Deputy General Manager of Groundwater and Water Resources, United Water Conservation District. Telephone call with Laura Brown, June 17, 2015.

Pajaro Valley Water Management Agency Act. 1984. (ACT 760, ch. 257) http://tinyurl.com/pnsdo94

Reyburn, Ivory. 2015. Personal Communication. Water Resources Supervisor, Coachella Valley Water District. Telephone call with Laura Brown, June 3, 2015.

RMC. 2003. Salinas Valley Water Project Engineer's Report. http://tinyurl.com/pmjquco

Stetson Engineers, Inc. 2015. Thirty-seventh Annual Engineering and Survey Report on Water Supply Conditions of the Santa Ynez River Water Conservation District 2014-2015.

Todd Groundwater. 2014. San Benito County Water District Annual Groundwater Report, December 2014. http://www.sbcwd.com/AnnualGWReport.pdf

United Water Conservation District, Resolution 2011-12 and Resolution 2015-06

Wales, Bruce. 2015. Personal Communication. General Manager, Santa Ynez River Water Conservation District. Telephone call with Laura Brown, June 17, 2015.

Appendix B

Comments and Responses to Comments on Methodology

Meeting Summary
Technical Review Committee
October 20, 2015

Participants

Technical Review Committee:
Carl Hauge, California Department of Water Resources (Retired)
Randy Hanson, US Geological Survey
Rebecca Nelson, Stanford Woods Institute (as of January 1, 2016 University of Melbourne Law School)

Project Team:
George Cook, Santa Clara Valley Water District
Bassam Kassab, Santa Clara Valley Water District
Cameron Tana, HydroMetrics WRI
Laura Brown, HydroMetrics WRI
Charles Gardiner, Catalyst Group

Questions and Comments

Topic Introduced by Carl Hauge

- **Does the water budget include a bedrock flow contribution? More wells pumping from bedrock would reduce mountain front recharge.**
  Response: The water budget includes a bedrock flow contribution so wells pumping from bedrock potentially do affect the water budget. However, the distribution and extent of fractures connecting the Quaternary deposits into bedrock is generally unknown. Unless there is specific information showing the extent of hydrogeologic connection into bedrock, bedrock areas will not be considered hydrogeologically connected with the Quaternary deposits.
- **Will the confining layer under the aquitard be included in hydrogeologically connected areas?**
  Response: Yes.
- **Include a map of the recharge areas in the methodology technical memorandum.**
  Response: The reason such a map was excluded is that we did not want to include results of implementation steps in the methodology memo. The map will be included in the technical study report.
- **Does "groundwater balance" mean a water budget? Use "water budget" to emphasize integrated resource management.**
  Response: Terminology in the memo is changed from "groundwater balance" to "water budget."
- **Randy Hanson also commented that conjunctive use should be made part of the metric.**
  Response: The water budget includes conjunctive use of surface water supplies and will be explicitly stated in discussion of water budget in the memo. For example, District activities in calendar year 2013 resulted in 96,500 acre-feet of managed aquifer recharge and 205,300 acre-feet of in-lieu recharge compared to 39,500 acre-feet of

natural recharge (SCVWD, 2014). Most of the District activities that provide benefit to groundwater users are conjunctive use activities.

- **Overall, this is a good exercise because you will develop more detail about managing groundwater, which is very much needed across the state.**
  Response: Comment noted.
- **The specificity of the zones shouldn't exceed the specificity of the data.**
  Response: The zones will, of necessity, exceed the specificity of the data as the zones will need to define the specific parcels that will pay groundwater charges. The zones will be based on the best approximation of the areas benefitting from similar District activities as supported by the available data. The study will also develop a procedure to apply for exemptions from the zones, which will increase the specificity of the data by allowing groundwater users to provide data for specific locations that could result in redefining zone boundaries in response to more location-specific data.
- **Have you considered the possibility that you will come up with the same zones?**
  Response: Without good information to change the zones, they will remain the same. The District is looking for an honest, unbiased evaluation of the zones of benefit without a preconceived outcome.

Topic Introduced by Randy Hanson

- **The fault lines may have a significant effect on groundwater flow, such as the Silver Creek Fault and underlying Vasona Creek.**
  Response: We will revise the memo to better recognize this possibility and make sure to evaluate groundwater flow in the vicinity of faults.
- **Are you looking at the benefits of other activities (besides District programs)?**
  Response: We are evaluating beneficial non-District activities to make sure benefits that may result from those non-District activities are not attributed to District activities in recommending modifications to zones. However, separate zones for areas where benefits from non-District activities occur will not be recommended.
- **Are you considering passive benefits? For example, the San Jose Water Company wells are constructed such that they provide a deep conduit to increase recharge of deep aquifer layers and provide water that can be re-pumped in to prevent subsidence.**
  Response: We will consider passive benefits that are identified in a similar manner to non-District activities discussed above, but there needs to be evidence that the passive benefits have improved or are improving the water budget.
- **Are there also areas where additional activities could have negative effects that could be defined as zones of hazard, e.g., pumping in the shallow central area could remobilize contaminants?**
  Response: Evaluation of negative effects from non-District activities is beyond the scope of this study.
- **Could District groundwater programs have adverse effects, such as increasing the artesian effects from "overfilling" the basin? The USGS model shows that the basin could be refilled to a point that could result in recharged water being lost back to the streams.**
  Response: The District manages its activities to minimize the risk of adverse effects. This possibility will not affect the definition of zones of benefit, which will be based on benefits resulting from District activities.
- **Oxygen and deuterium isotopes have been used to track the extent of recharge. Could that approach be used here?**

Response: Yes, as stated in the methodology memo, isotopic analyses that differentiate ambient groundwater from recharge water will also be considered. We have identified these data collected by the GAMA program (Ray, 2009) and as part of the Olin remediation project (MACTEC, 2009).

- **The overall groundwater quality of the basin is very good, much better than many other basins in California. What is the quality concern, and what water quality benefits are you looking for?**
  Response: This evaluation will occur in areas where there is an identified quality concern. For example, nitrate concentrations are high in ambient groundwater in portions of the Llagas subbasin. Imported water used for managed aquifer recharge has a dilution benefit by adding water with low nitrate concentrations to the groundwater balance (MACTEC, 2009). Perchlorate could be another relevant quality concern.
- **How will the Santa Clara Valley comply with SGMA and will activities be credited?**
  Response: SCVWD is named as the exclusive groundwater management agency for Santa Clara County, and will be updating the groundwater management plan in accordance with SGMA requirements. The plan will cover the Santa Clara and Llagas groundwater subbasins. The updated groundwater management plan will reflect the District activities that provide benefits used to define the zones of benefit.

Topic Introduced by Rebecca Nelson

- **Have the recharge areas changed over time?**
  Response: Recharge facilities have changed over time in that they have come online at different times and the water delivery to them varies with availability and recharge needs. The differences in timing of recharge for different areas will be evaluated in the analysis to identify benefits from recharge activities with different histories.
- **Have you thought about changes in water use over time, from agriculture to urban, and changes to the levels of conservation? Describe the background levels of land use change that could explain the differences that are not the result of District programs.**
  Response: The memo discusses evaluation of net demand to assess whether improving groundwater conditions can be attributed to District activities. We will revise the memo to clarify that land use change could cause changes in net demand and the study will include a high level description of land use changes that have caused changes in net demand.
- **The Great Oaks lawsuit may change the definitions you are using.**
  Response: District staff will ensure the study complies with all legal requirements including any requirements resulting from a final decision rendered in the Great Oaks case.
- **It makes sense that if there is a benefit, users pay for it.**
- **Include conservation as a beneficial activity.**
  Response: District conservation activities are included as providing benefit, but will likely not be a major factor in defining zones because those activities and benefits are widespread throughout the District.
- **Will the zones cover the entire basin?**
  Response: The zones may not cover the entire basin. Only areas identified as benefitting from District activities will be included as zones. For example, bedrock areas that don't receive water deliveries from SCWVD likely will not be part of the zones unless there are data showing a hydrogeologic connection into bedrock from Quaternary deposits.

- **Will planned activities substantially change the area of benefit?**
  Response: We will evaluate benefits from planned activities with available information, but the study will also develop a procedure for revising zones in the future to reflect benefit changes and a recommended timeframe for regularly reviewing and updating the zones.
- **Both Carl Hauge and Rebecca Nelson commented that it is good to be developing a methodology that can be repeated in the future.**
- **What would happen if there is disagreement between the model and physical data?**
  Response: If either of the lines of evidence demonstrate that groundwater users in an area benefit from a set of District activities, then the area will be mapped as benefitting from that set of District activities. For example, there may be factors that result in the data not clearly demonstrating a benefit, or the model may not show improvement greater than the error of calibration. Therefore, if the data show benefits that can be attributed to District activities, or if the model shows improvement greater than model uncertainty, then a benefit will have been demonstrated.
- **Randy Hanson commented that model accuracy depends on what you are using for calibration. You need to use higher order observations, stream flows, etc., not just groundwater levels, to calibrate the model. Note that the USGS also looked at rejected infiltration.**
  Response: We will be using the groundwater models as calibrated by the District to groundwater levels. This is appropriate because the methodology uses the model to look at head differences under different scenarios. Calibrating the model to other observations is not part of the study's scope.
- **It is good to quantify uncertainties in the model. Also discuss how the uncertainties will influence how you draw boundaries.**
  Response: Model results need to show groundwater level improvement greater than model uncertainty to demonstrate benefit. Where model results define boundaries, recommended modifications to zones of benefits will only be based on areas where modeled groundwater level improvement is greater than model uncertainty.
- **Carl Hauge commented that relying on the model vs. demonstrated increase in head could be controversial. Landowners will trust measurements over model results.**
  Response: Ideally, both the data and the model will show similar results. However, as discussed above, measured data may not be available in all areas or data may not demonstrate benefit due to other factors. In such cases, using the model will isolate effects of District activities and, therefore, it is appropriate to use model results.
- **How do you connect groundwater levels to water supply reliability?**
  Response: In general, higher groundwater levels indicate higher water supply reliability due to lower risk of wells drying out, lower risk of well damage from aeration of screens, higher yields, and lower pumping costs.
- **Carl Hauge noted that developing a scale of reliability would be a difficult exercise.**
  Response: Yes, a reliability scale would be difficult, which is one of the reasons why relative differences in benefits from a similar set of District activities will not be used to define zones.

- **TRC members expressed appreciation for the presentation and discussion.**
- **The TRC agreed to provide any additional questions or comments by November 6, 2015.**

Comments Provided by Rebecca Nelson via email November 10, 2015

- **Current versus planned activities: The document refers to zones reflecting areas receiving benefits from current and planned District activities. The District should consider whether it is equitable/legal to include within a zone an area that will only receive benefits in the future (and if so, how far into the future is justifiable), or whether the boundaries of zones should change in the future in response to the commencement of significant future District activities. The document also occasionally refers to “potential” activities. This sounds a little too uncertain or hypothetical to justify zone boundaries, whereas “planned” activities seems more justifiable.**
  Response: Planned District activities will be considered as a different set of activities than current activities. An area that will only receive benefits in the future from planned activities will be recommended as a separate zone from areas that receive benefits from current activities. Likewise, areas that receive benefits from current activities may be recommended to be divided into multiple zones if only parts of those areas will receive benefits from planned activities.

  A process for conducting future reviews of zones of benefit that will be developed as part of the study. A review of zone boundaries based on benefits from new or expanded District activities will be included in that process. We will also revise the methodology memo to only include planned activities and not potential activities.
- **Quality as a benefit: In relation to quality as a benefit, it would be helpful to explain the statement on page 15 that connects in lieu recharge with groundwater protection activities: “Areas that benefit from … in-lieu recharge activities are also assumed to benefit from the groundwater protection activities.” I wasn't clear on the mechanism for in-lieu recharge to influence groundwater quality.**
  Response: This does not refer to a physical mechanism for in-lieu recharge to influence groundwater quality. Groundwater protection activities provide broad benefits to groundwater quality throughout the groundwater basins. Areas where there are in-lieu recharge benefits to groundwater supply are assumed to also benefit from groundwater protection activities because those activities protect (i.e. preserve) the groundwater supply that is more reliable due to in-lieu recharge.
- **The overall approach is clearly well thought out, and the District should be congratulated on its effort and approach, which appears to be uniquely rigorous in the state.**

Meeting Summary
Joint Meeting of the Water Retailer Water Supply and Groundwater Committees
October 22, 2015

Joint Meeting of the Water Retailer Water Supply and Groundwater Committees

Zone of Benefit Study

- **Have notices gone out for the October 28 small group briefing meeting?**
  Response: Notices went out October 17, 2015.
- **Who is commenting on the Methodology Technical Memorandum?**
  Response: We received verbal comments from the two attendees at the October 28 meeting: a mutual water company representative and interested citizen. We also received written comments from Stanford University.
- **Is the District taking frequent measurements of subsidence?**
  Response: To monitor subsidence in the Santa Clara Subbasin, the District:
  - monitors two 1,000-foot deep extensometers that measure vertical ground motion
  - conducts annual benchmark leveling surveys along three cross valley level circuits
  - measures water levels at ten subsidence index wells to ensure they remain above established thresholds.
- **What are the main things you hope to get out of the Zone of Benefit Study?**
- Response: The District's goals for the Study are: 1) Develop a well comprehensive process for evaluating the Zone of Benefit boundaries based on the latest information and technology, 2) ensure that the boundaries are accurate and reflect hydrological conditions in a way that groups pumpers based on the benefits they receive from current District programs, and 3) develop processes for exemption requests and future changes.
- **Will this study help with groundwater modeling?**
  Response: The study will use groundwater modeling. It is possible that evaluation of model runs will inform future groundwater modeling improvements.
- **Does the Technical Memorandum outline what is different now about this approach?**
  Response: The technical memorandum outlines what is different from previous work, but does not outline differences with what was presented in our first presentation to the retailers.
- **This will presumably help the District comply with Proposition 218.**
- Response: Proposition 218 restricts local governments' ability to impose assessments and property-related fees and requires elections to approve many revenue raising methods. The District does not believe that its groundwater charges are subject to Proposition 218; however, it has also ensured that its groundwater charges are adopted in a manner consistent with Proposition 218 as a matter of policy. The study is consistent with this policy in that it will help ensure that the District's charges are appropriately aligned with the costs of providing service and the benefits payors receive
- **Will there be new information about the hydrogeology?**
  Response: We will use available information about hydrogeology, including a new study published by the U.S. Geological Survey in the last two years.

Participants

George Cook, Aaron Baker, Water Retailers
Cameron Tana, HydroMetrics WRI

Charles Gardiner, Catalyst Group

Meeting Summary
Stakeholder Small Group Meeting
October 28, 2015

George Cook provided an overview of the purpose of the Groundwater Zone of Benefit Study and Cameron Tana reviewed the study methodology.

Comments and Questions

1. **Have you sampled salt in the groundwater to determine where the saltwater intrusion is?**
   Response: Yes, Figure 5 of the draft technical memo on the study methodology is based on ongoing salinity monitoring in groundwater wells.
2. **Where does the replenishment come from to reduce the intrusion?**
   Response: SCVWD captures surface water runoff and imports water from the State Water Project and Central Valley Project. These sources provide water for managed and in-lieu recharge that maintain groundwater levels and help to prevent subsidence and saltwater intrusion.
3. **The resiliency of the basin since 1980 is impressive.**
   Response: comment noted.
4. **The 1975 to 1979 period was a severe drought, which could have contributed to the saltwater intrusion.**
   Response: Yes, climatic conditions can affect groundwater conditions such as saltwater intrusion. However, much of the advancement of the saltwater intrusion from 1945 to 1980 as shown in Figure 5 was related to declining and depressed groundwater levels related to increases in groundwater pumping.
5. **Higher average rainfall after 1980 also provided a benefit to the groundwater basin and helped reduce saltwater intrusion.**
   Response: Yes, climatic conditions can improve groundwater conditions such as saltwater intrusion. The study methodology evaluates climatic conditions to identify groundwater benefits that can be attributed to District activities and are not the result of climatic conditions.
6. **The groundwater basin is connected only to a certain point. There are wells in South County that are only a half-mile apart and show very different groundwater levels.**
   Response: Water levels in individual wells can vary greatly, even if the wells are located in close proximity. This difference can be caused by either hydrogeologic difference, or by differences in well construction or adjacent pumping. The study methodology includes evaluation of groundwater level trends to evaluate whether benefits extend throughout mapped alluvium.
7. **Are you using actual well log data to determine the extent of the alluvium and the hydrogeology of the basin?**
   Response: Due to the size of the basin and limited availability of well logs along the edge of the basin, we are not evaluating well log data to determine extent of the alluvium and hydrogeology. However, we are using published reports, such as those by the U.S. Geological Survey and California Geological Survey. Those reports used actual well log data.
8. **The study should look at well data throughout the zones, not just information down the center of the basin.**
   Response: The published reports that will be used to map hydrogeology used well data throughout the basin. The study of groundwater levels and other data will include available data from throughout the basin.

9. **At the New Avenue Mutual Water Company, we have some well data that dates back to 1978. More recently, we have collected well data more regularly and more extensively. We can make this data available.**
   Response: The draft technical memorandum discusses the use of stakeholder data. Data being considered for use will be evaluated to verify adequate measurement protocol and ensure there are sufficient regularly measured static groundwater levels to evaluate trends during times of increased volumes from District activity. Stakeholders that wish to share their well data to support this evaluation should submit all information about the well such as a well log and construction information.
10. **The groundwater levels in the New Avenue Mutual Water Company wells are where we would expect them to be given the drought and weather conditions.**
    Response: The study methodology evaluates climatic conditions to ensure groundwater benefits can be attributed to District activities and not climatic conditions.
11. **Since the San Felipe project went online, groundwater levels went from 145 feet to 130 feet.**
    Response: The evaluation of whether a benefit is occurring requires looking at other factors than just the change in water levels. Increasing demand (pumping), wet years, and drought will cause water levels to decline or increase independently of any benefit from District activities. The study will evaluate the water level trends by comparing the observed and expected trends with trends (i.e in a drought period, a decline in water levels would be expected; if the observed trend is increasing or stable, a benefit from District activities would be indicated). The study methodology will assign benefits to an area only if there are periods of stable or increasing groundwater level trends that can be attributed to District activities.
12. **We don’t see a benefit from recharge activities at Church Avenue and along Highway 101.**
    Response: The study intends to document where groundwater benefits are demonstrated. The stakeholder review process will provide an opportunity to review the findings prior to the District adopting the zone boundaries.
13. **How do you measure groundwater pumped by farmers?**
14. Response: Groundwater pumping is measured by either metering or through the use of standardized water use factors. Meters are required for wells that meet the following volumetric thresholds:

Zone	Volumetric Threshold for Metering (AF/Yr)	
	Municipal	Agriculture
W-2	1	4
W-5	2	20

    Factors used to estimate groundwater pumped by smaller users include the number of residents, lawn area, and crop type.

15. **There is a discrepancy between actual water use and what the formula determines for unmetered groundwater pumping.**
    Response: It is not practical to meter all wells due to the cost for installing, maintaining, and operating (including reading) meters. The water use for smaller accounts is an estimate based on self reported information and standard water use factors. The factors are based on published studies and industry standards and are regularly reviewed and updated as necessary. Although the volume pumped from smaller wells is an estimate, over 90% of the groundwater pumped is from metered wells.

16. **The residential use in South County is not very large. Farmers are cycling three crops a year and using a lot of water.**
    Response: The relative use of water by different stakeholders will not be a consideration for how zones are mapped. The zones will be mapped based on the extent of benefit from District activities. Groundwater charges are assessed based on use and volume.
17. **How do you forecast precipitation trends?**
    Response: We are looking at past precipitation trends in the historical data, not forecasting future precipitation.
18. **Have you considered farming operations and the amount of water that evaporates, get taken up by plants, and recharged back into the ground? At least 50% is percolating back into the ground.**
    Response: We are considering changes in net demand to evaluate whether changes in groundwater conditions can be attributed to District activities. Net demand by farming will mostly be related to crop evapotranspiration demands and not changes in return flow. The groundwater models that will be used as part of the evaluation account for return flow.
19. **What is the time it takes for water to percolate from recharge ponds to the 300-foot aquifer? Are you considering that time when you are looking for the effects of groundwater programs?**
    Response: We will consider the delay in effect from the implementation or changes in the recharge activity in the data evaluation.
20. **Show a chart of the amount of water put into the basin and the precipitation patterns. Show the volumes of natural recharge and the amount of District recharge.**
    Response: This information will be included in the study.
21. **The groundwater quality in the south County is very good. If anything, recharge activities add contamination to the basin.**
    Response: Recharge activities can actually improve water quality by diluting certain contaminants such as nitrate or perchlorate. The District monitors the quality of the water at our recharge facilities. Recharge water quality is generally good, with most water quality indicators similar to or better than receiving water throughout the year. Groundwater quality benefits from managed recharge activities will be assessed.
22. **Where did perchlorate in the groundwater basin come from?**
    Response: Perchlorate has been attributed to contamination from Olin Corporation's former road flare manufacturing facility in Morgan Hill. (SCVWD)
23. **For the most part, people take water for granted. The New Avenue Mutual Water Company has 108 shareholders; only about 10 shareholders attend the annual meeting.**
    Response: comment noted.
24. **How detailed is the methodology for prescribing the analysis and results?**
    Response: The methodology is detailed for describing the analysis, but does include flexibility. Any changes to the methodology will be fully documented in the study report. The methodology does not prescribe results.
25. **Is there a time we can present data that our area doesn't benefit from recharge programs? Our area has static water levels and steady consumption over the last 30 years. We have cut water use by 25%, but we haven't seen any change in the water levels. Some surface springs have dried up, but the 300-foot aquifer doesn't show much change.**
    Response: Please provide the data by the end of February if you would like it to be considered for this study.
26. **New users need to pay for new water.**
    Response: comment noted.

27. **Be objective in the analysis. Deal with the data to reach conclusions. Don't be subjective.**
    Response: The study methodology is based upon published studies and data. Hydrometrics will be objective in their data analysis.
28. **South County lost control of the water district when Gavilan merged with SCVWD.**
    Response: Comment noted.
29. **What do you mean by visually evident changes when reviewing the data?**
    Response: We mean that when any reasonable person reviews the graph of the data, they should be able to see the trends that we are describing. We will not use statistics to state that there is a trend that is difficult to see. Statistics will only be used to quantify the visually evident trend.

Participants

Loverine Taylor, Portola Valley
Alan Heinzen, New Avenue Mutual Water Company
Vanessa de la Piedra, SCVWD
George Cook, SCVWD
Bassam Kassab, SCVWD
Cameron Tana, HydroMetrics WRI
Charles Gardiner, The Catalyst Group

5750 Almaden Expressway, San Jose, CA 95118-3614 | (408) 265-2600 | www.valleywater.org

Santa Clara Valley
Water District

April 18, 2016

Mr. Tom Zigterman
Director - Water Resources & Civil Infrastructure
Stanford University
327 Bonair Siding
Stanford, CA 94305-7272

Subject: Response to Stanford Comments on the Santa Clara Valley Water District Zone of Benefit Study

Dear Mr. Zigterman:

The Santa Clara Valley Water District (District) received Stanford's letter dated November 5, 2015 providing comments on the Draft Technical Memorandum, Methodology for Evaluating Groundwater Zones of Benefit. The District's responses to your specific comments are attached. These, along with other comments received and responses, will be posted on the study website and included in the Preliminary Zone of Benefit Study Report.

In summary, the District believes the current study methodology addresses your comments concerning hydrogeologic and hydraulic variability and accounting for non-District activities. The comment regarding a groundwater charge credit is noted, but is beyond the scope of this study, which is focused on the extent of the zones of benefit, rather than rates or credits applied within those zones.

Thank you for providing your comments on the study. If you have any questions, please call me at (408) 630-2964.

Sincerely,

George E Cook Jr

George Cook, P.G.
Associate Engineering Geologist
Groundwater Monitoring and Analysis Unit

cc: J. Fiedler, G. Hall, V. De La Piedra
Cameron Tana, Hydrometrics Water Resources

Attachments: Stanford Comment Letter Dated November 5, 2016
District Response to Stanford Comments

Stanford University SUSTAINABILITY AND ENERGY MANAGEMENT

November 5, 2015

Mr. George Cook
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

Subject: Santa Clara Valley Water District Zones of Benefit Study
Stanford's initial comments on the ***Draft Technical Memorandum, Methodology for Evaluating Groundwater Zones of Benefit*** (Hydrometrics WRI, September 2015)

Dear Mr. Cook:

Stanford University appreciates the opportunity to provide comments on the *Draft Technical Memorandum, Methodology for Evaluating Groundwater Zones of Benefit,* Hydrometrics WRI, September 2015 (hereinafter referred to as the Draft Tech Memo). As you are aware, the technical, legal and equitable basis for the Santa Clara Valley Water District's (District) groundwater pumping charge has long been an issue for the University. The University is encouraged by the District's study and is supportive of the District's efforts to take a hard look at the current benefit zones supporting the District's groundwater charge. Stanford provides the following comments to inform the Draft Tech Memo and the District's Zones of Benefit study process going forward.

1. The Zones of Benefit study should account for hydrogeologic and hydraulic variability throughout the Zones and sub-areas within the Zones.

   Stanford requests that the Zones of Benefits analysis investigate and recognize the unique characteristics of the San Francisquito Cone from which Stanford and other local pumpers derive groundwater supply. The axis of this physiographic feature closely coincides with the modern-day San Francisquito Creek channel and is a source of groundwater on either side of the Santa Clara-San Mateo County line. The County line is the current Bulletin 118 boundary separating the Santa Clara and San Mateo Subbasins (Department of Water Resources Bulletin 118 - Update 2003). Hydrogeologic continuity across this boundary has been observed and reported in DWR investigations, and the alluvial fan of San Francisquito Creek was historically termed the San Francisquito Groundwater Area (Bulletin 118-1, 1967). Within this area, wells of distinctively favorable yield and quality have been developed and used for municipal and agricultural purposes since the early 1900s. These distinctive characteristics were not recognized in the District's 1963 W2 Zone classification and we now urge the District to acknowledge the importance of these physiographic and hydrogeologic features that have long been recognized locally through their effects on groundwater development and protection.

   The Zones of Benefit study also should recognize that seawater intrusion and subsidence impairments vary throughout the Zones, and have been determined to be minor and relatively insignificant in the

San Francisquito Cone area. While concerns regarding degradation of freshwater aquifers in the Palo Alto area were raised decades ago, ultimately water quality degradation was determined to be due to improperly sealed wells and vertical migration from shallow brackish aquifers downward through well structures, not seawater intrusion. The presence of Bay muds and the configuration of the primary supply aquifers in relation to the Bay were not conducive to intrusion as in the southern part of the Valley. Subsequently, the local problem of vertical migration through wells was effectively mitigated through well sealing practices. Similarly, as should be apparent from previous studies available to the District, a lack of measureable subsidence on and around the Stanford campus, even during periods of groundwater decline in the 1950s and 1960s, is consistent with the coarse nature of aquifer materials in the San Francisquito Cone area where most of the local groundwater supplies are developed. From these studies, the San Francisquito Cone area is far less vulnerable to localized subsidence due to pumping than other areas of the basin. The Zones of Benefit study must take into account this local variability.

2. The Zones of Benefit study should identify and account for local or regional groundwater management benefit in the same manner as District activities that benefit the zones or subareas of zones

In addition to the hydrogeologic and hydraulic factors discussed above, the Zones of Benefit study should assess historic and current benefits of District and local activities on the basis of actual effects to groundwater availability and quality. Stanford refers the District to its own historical technical studies concerning the significant effects of overdraft in the region and the myriad solutions and projects that were brought to bear – by the District and local interests – to address declining water levels, seawater intrusion, and subsidence. We note, for example, that while the District once considered a cross valley conveyance to deliver surface water to cities and areas in the north and northwest areas of the basin, water imported by the District ultimately was delivered to other areas of the basin to mitigate overdraft in the southern areas. The Zones of Benefit study must recognize that conditions of groundwater decline and overdraft in the northwest portions of the basin were addressed locally, at great expense, by connecting to the San Francisco water system at roughly the same time that the District's surface water imports commenced in the southern part of the basin. These distinct local activities, which continue today, addressed groundwater conditions in the northwest portions of the basin, and should be recognized in the Zones of Benefit study and in future District decisions concerning groundwater fees.

Proper allocation of benefits is a particularly important concern to the University with respect to methodologies pertaining to analysis of groundwater levels. Absent evaluation of local activities and conditions at appropriate local scales, along with their relative effects on historical groundwater levels, the study will incorrectly characterize improved and stabilized groundwater levels solely to District activities. As discussed below under Comment 3, local activities by Stanford and others in the

San Francisquito Creek groundwater area have long been recognized to provide benefits that are not the result of District activities.

The University previously discussed with the District the University's own local groundwater management efforts, such as augmentation of natural recharge through Lake Lagunita located on campus which has a direct, significant and beneficial impact on the local groundwater supplies and conditions in the San Francisquito Creek cone area where Stanford's wells are located. The viability of recharge augmentation is supported in historical reports of the geology and replenishment sources of the San Francisquito Cone (DWR Bulletin 118-1, 1967). The District's current proposed study should identify, quantify and incorporate these local and regional activities where concurrent efforts of non-District entities have resulted in the protection and augmentation of local groundwater supplies for the past several decades. The University is not aware, for example, that local groundwater protection activities, such as augmented recharge in Lake Lagunita, were previously recognized or accounted for by the District. This adds to our concern that the proposed analyses of groundwater levels (e.g., Draft Tech Memo: Analysis Applied to Groundwater Level Data) will not be based on an appropriate level of detail or historical perspective. Such detail and perspective can only be achieved through a major outreach to water entities and users throughout the District, which is clearly not part of the methodologies described in the Draft Tech Memo.

3. The Zones of Benefit study proposes to employ groundwater modelling

As stated in the Draft Tech Memo (Groundwater Model Simulations), the use of groundwater flow models is proposed as a "second and equivalent line of evidence evaluated for the effect of District activities in different areas." The University is not aware that the District's past or current groundwater flow models are sufficiently refined and calibrated to meet the stated objectives in the Draft Tech Memo in the area of the Santa Clara-San Mateo Subbasin boundary where Stanford's groundwater resources occur. Therefore, it is difficult to see how the District's study will appropriately allocate benefits using such a tool. To the extent that a groundwater modeling is employed in the Zones of Benefit study, Stanford would like the opportunity to review and evaluate the District's model and to work with the District to incorporate appropriate information and data concerning the relative benefits of local, non-District groundwater management and augmentation activities. Stanford has monitored local groundwater conditions and observed local benefits and effects of its own groundwater management activities in the San Francisquito Creek cone area, commencing with the historical development of local groundwater resources and importation and augmentation of surface water to address groundwater decline. To the extent that groundwater data Stanford possesses might be useful and inform the District's current study, we would be happy to meet and discuss further.

4. The District should consider restoring the Groundwater Charge Credit for local investment in in-kind groundwater management activities.

   In recognition of the local groundwater management programs and projects that have been implemented by parties other than the District, the Zones of Benefit Study should consider restoring the groundwater charge credit that once existed in the District groundwater charge structure. The credit recognized the benefits and investment of various entities in certain areas of the basin, including the City of Palo Alto and Stanford University, to import surface water from San Francisco in lieu of or to reduce the use of groundwater. These activities are precisely what the Zones of Benefit study will attempt to quantify as it relates to District activities, and there is no reason the study should not also consider and incorporate local groundwater management efforts that result in the same Basin benefits. Similarly, the study should quantify and incorporate local groundwater augmentation activities, such as Stanford's groundwater replenishment activities at Lagunita on the Stanford Campus, and should include programs to credit and reimburse local entities for those groundwater benefits.

5. The Zones of Benefit study must consider weighting of the relative benefits of certain activities in various areas of the basin.

   The Draft Tech Memo discusses other groundwater charge programs and cost allocation/ benefit assessment methodologies employed by other agencies in California. One feature of some of the more successful of these methodologies is a "relative weighting" concept, whereby the benefits to certain areas of the basin are weighted relative to the benefits received in other areas for that particular benefit. For example, whereas direct and in-lieu recharge may provide a water quality benefit to a broad area within a zone, certain sub-areas of the zone may receive a much greater benefit than other areas. The Zones of Benefit study should be refined such that the relative benefits are accounted for in the development of new zones, or within the components of the groundwater charge assessed within a particular zone. Similarly, the study should account for the relative value of particular benefits (e.g., groundwater elevation benefits vs. subsidence benefits), and should be designed to allocate the actual District costs to provide certain benefits (e.g., the cost of providing water quality benefits vs. the cost of providing protection against subsidence).

The Draft Technical Memorandum should be revised to reflect these general scoping comments. In addition, while not a complete review, we do have some examples of specific comments on the text of the Draft T.M.:

> Page 1, second paragraph, second sentence: the sentence should be revised to read: "Although the District is not aware of any specific problems with the existing Zone of Benefit designations, *the*

District has received requests for a benefits analysis and recognizes that it is important for the District to periodically undertake…".

Page 1, fourth paragraph, third sentence: the sentence should be revised to read: "Unless adjacent bedrock areas *and areas that are hydraulically up-gradient from the District's recharged areas are receiving District water supply, it will be assumed that the areas are not within the zone of benefit…*".

Page 2, point 4: replace "demonstrate" with "assess".

Page 3, third paragraph, first sentence: revise to read "The Study will *identify and* evaluate the ways…".

Page 3, add another paragraph that reads: "*The Study will also consider non-District import of water supply by groundwater users (which decreases their use of groundwater), and recharge conditions and activities conducted by groundwater users.*".

We look forward to working with the District on this important Study. Please let us know if you would like to meet and discuss these comments, the Study process, or Stanford's understanding of the groundwater conditions in the San Francisquito Cone area.

Sincerely,

Tom W. Zigterman

Tom W. Zigterman, P.E., D.WRE

Director – Water Resources and Civil Infrastructure

Response to Comments
Received from Stanford University
November 5, 2015

Comments

1a. The Zones of Benefit study should account for hydrogeologic and hydraulic variability throughout the Zones and sub-areas within the Zones.

Response: Hydrogeologic features will be mapped to assess the extent of hydrogeologic connection to District activities. If information can be provided to show features that limit the hydrogeologic connection in the Quaternary deposits, those features will be considered. The sections of DWR Bulletin 118-1 referenced by the commenter and Bulletin 118 updates will be reviewed, along with other relevant hydrogeologic studies, to evaluate the connection of the San Francisquito Cone with Quaternary deposits of the Santa Clara Plain. However, the possibility that adjacent areas have different yield or hydraulic characteristics does not preclude a hydrogeologic connection; therefore the different yield or hydraulic characteristics do not necessarily prevent the occurrence of a groundwater benefit from District activities within an area. The data analyses are meant to test the assessment of hydrogeologic connection of an area with District activities and available data should account for any hydrogeologic and hydraulic variability that limits the extent of a benefit to an area.

1b. The Zones of Benefit study should recognize that seawater intrusion and subsidence impairments vary throughout the Zones, and have been determined to be minor and relatively insignificant in the San Francisquito Cone.

Response: Benefits from District activities may take the form of improved groundwater supply reliability via improved groundwater levels, improved groundwater quality, and/or the prevention of seawater intrusion and subsidence. Areas receiving reasonably similar aggregate benefits from similar sets of District activities will be grouped together in the recommended zones.

2a. The Zones of Benefit study should identify and account for local or regional groundwater management benefit in the same manner as District activities that benefit the zones or subarea of zones.

Response: The methodology addresses the commenter's point that "Absent evaluation of local activities and conditions at appropriate local scales, along with their relative effects on historical groundwater levels, the study will incorrectly characterize improved and stabilized groundwater levels solely to District activities." Non-District, non-groundwater supplies of water will be subtracted from water demand to calculate a water supplier's net demand for District water and groundwater over time for the supplier's service area. When net demand is decreasing due to local activities, an improving groundwater level trend will not demonstrate a benefit from District activities (see Table 1 in draft memo). The draft memo refers to "retailers" net demand in this discussion, but that will be revised to "water suppliers" to clearly include suppliers that do not receive surface water from the District.

2b. The University is not aware, for example that local protection activities, such as augmented recharge in Lake Lagunita, were previously recognized or accounted for by the District. This adds to our concern that the proposed analyses of groundwater levels will not be based on an appropriate level of detail or historical perspective. Such detail and perspective can only be achieved through a major outreach to water entities and

users throughout the District, which is clearly not part of the methodologies described in the Draft Tech Memo.

Response: Local recharge quantities will be considered in the calculation of non-District net demand discussed in the response to comment 2a. Please provide data showing these quantities over time. There is discussion in the technical memorandum about using groundwater level data provided by stakeholders, but the memo will be revised to clarify that other information from stakeholders, including data related to the calculation of net demand, will also be considered.

The Draft Tech Memo focuses on the technical methodology, but outreach is a major part of the project. The stakeholder outreach plan is intended to provide a transparent process that includes public access to the data used and provides the opportunity for interested parties to submit supplemental data that they believe would influence the benefit assessment. The study has been discussed in several Water Retailer Groundwater Subcommittee meetings, and updates will continue to be provided through that forum as the study progresses. A web site providing the tentative study schedule and comment opportunities as well as links to documents developed as part of the study has been created (http://www.valleywater.org/ZoneofBenefitStudy/). Stanford University has been added to the list of those to receive project updates and small group briefings.

3. The University is not aware that the District's past or current groundwater flow models are sufficiently refined and calibrated to meet the stated objectives in the Draft Tech Memo in the area of the Santa Clara-San Mateo Subbasin boundary where Stanford's groundwater resources occur.

Response: As stated in the Draft Tech Memo, we will ensure that the benefits we identify using the model or other analytical tools are the result of District activities, and not model uncertainty. We would request that you provide any Stanford data that might be useful for the groundwater level analysis. As described in the Draft Tech Memo, data being considered for use will be evaluated to verify adequate measurement protocol and ensure there are sufficient regularly measured static groundwater levels to evaluate trends during times of increased volumes from District activity. Stakeholders are encouraged to submit all information about their wells, such as a well log and construction information, to the District. We appreciate your offer to meet and discuss your data, and will contact you to schedule a meeting.

4. **The District should consider restoring the Groundwater Charge Credit for local investment in-kind groundwater management activities.**

Response: The zone of benefit study is limited to recommending new or modified zones based on benefits from District activities and does not encompass policies related to fees and charges. If the District Board of Directors approves changes to the zones of benefit, a separate rate study will be performed. Restoring a groundwater charge credit would be a separate policy consideration.

As stated in the response to comment 2a, local activities will be considered to ensure that benefit is not assigned to District activities when the benefit may result from non-District activities. Only when benefit from District activities can be demonstrated will that benefit be used to define zones of benefit even though there may be additional benefits that result from local investment.

5. The Zones of Benefit must consider weighting of the relative benefits of certain activities in various areas of the basin

Response: Separate zones will be defined for areas where groundwater users receive benefits from different sets of District activities. This concept has been used by other agencies in California as discussed in the Draft Tech Memo Appendix A and is also consistent with requirements of the District Act.

Our research and interpretation of groundwater benefit zones established by other California agencies does not present examples of a "relative weighting" concept as described by the commenter. The relative benefit is likely to continuously change with distance from District activities, so defining zones based on a specified level of benefit would be arbitrary. The methodology includes evaluation of different types of benefits in order to assess the extent of benefit to the water budget from specific District activities. However, the different types of benefit will not be used to assess or weigh relative benefit. The zones will be drawn based on District activity that is improving the water budget of the shared resource for the area and on the premise that all groundwater users in the associated area should pay an equal share for the activity.

Suggested Edits

P. 1, 2nd paragraph, 2nd sentence: Suggestion partially accepted and memo will be revised to read: "Although the District is not aware of any specific problems with the existing Zone of Benefit designations, the District has received requests for exemption and recognizes that it is important for the District to periodically undertake…"

P. 1, 4th paragraph, 3rd sentence: "Unless adjacent bedrock areas and areas that are hydraulically upgradient from the District's recharge areas are receiving District water supply, it will be assumed that the areas are not within the zone of benefit…"

Response: This suggested edit will not be incorporated. Groundwater level improvements from recharge areas can transmit upgradient of the recharge areas.

P. 3, 3rd paragraph, 4th bullet: "Use groundwater data and groundwater flow models to ~~demonstrate~~ assess the benefit of District activities."

Response: The bullet will be changed to "Use groundwater data and groundwater flow models to *assess where the benefit of District activities can be demonstrated.*"

P. 3 add paragraph: "The Study will also consider non-District import of water supply by groundwater users (which decreases their use of groundwater), and recharge conditions and activities conducted by groundwater users."

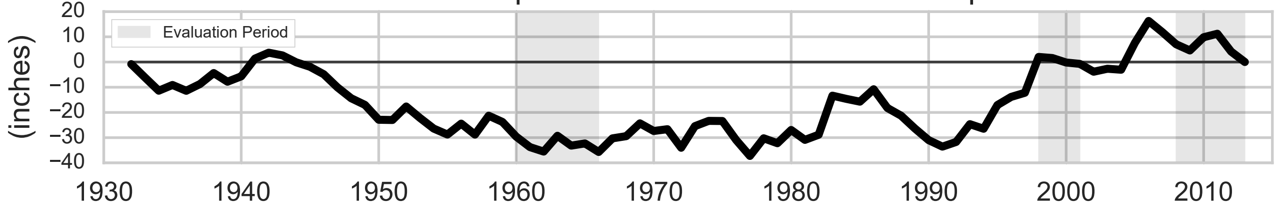
Response: The study is considering non-District supplies to ensure observed groundwater improvements can be assigned to District activities as stated in the response to comment 2a. However, zones of benefit will be based on where benefits from District activities can be demonstrated only. Since this introduction describes the general basis for the zones, this detail will not be added.

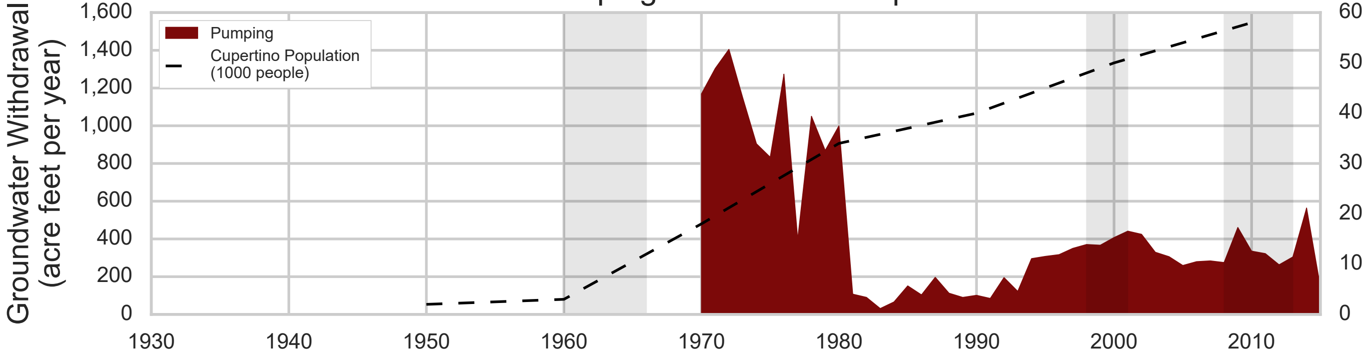
MONTGOMERY
& ASSOCIATES

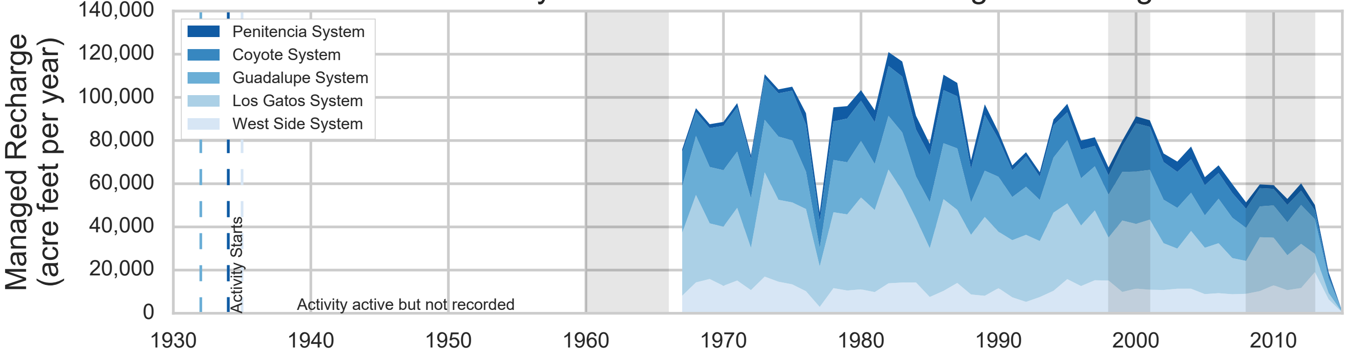
Appendix C

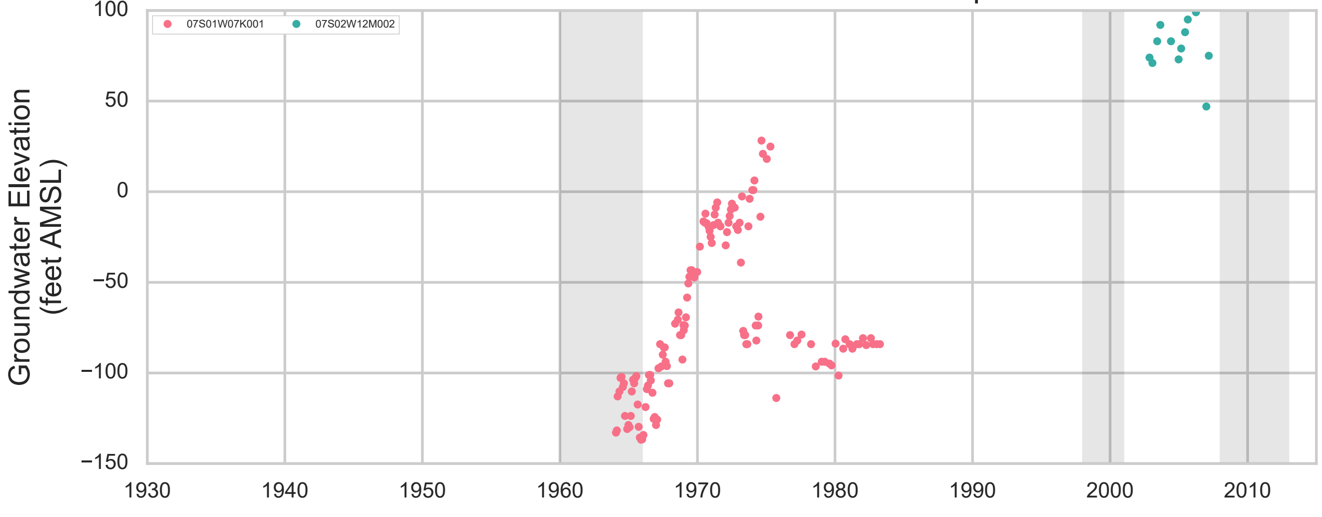
Groundwater Level Trends in Monitoring Wells to Evaluate Benefits from Managed Aquifer Recharge in Santa Clara Subbasin

Pumping Area: Cal Water Cupertino: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells


Cumulative Departure from Mean Annual Precipitation

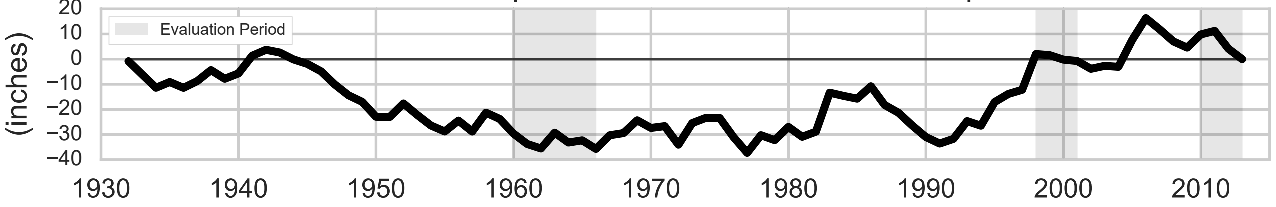

Groundwater Pumping in Cal Water Cupertino: TW Area


District Activity: Santa Clara Subbasin Managed Recharge

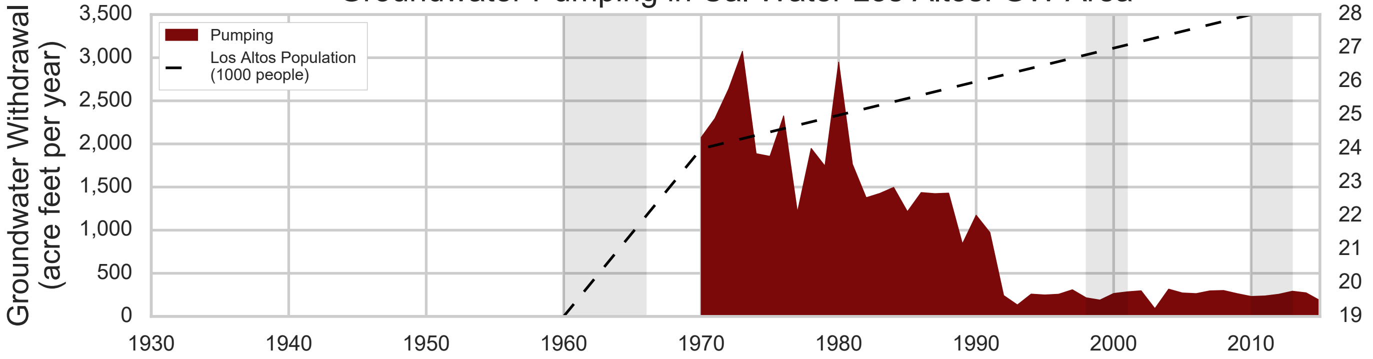

Observed Groundwater Elevations in Cal Water Cupertino: TW Area

Pumping Area: Cal Water Los Altos: GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

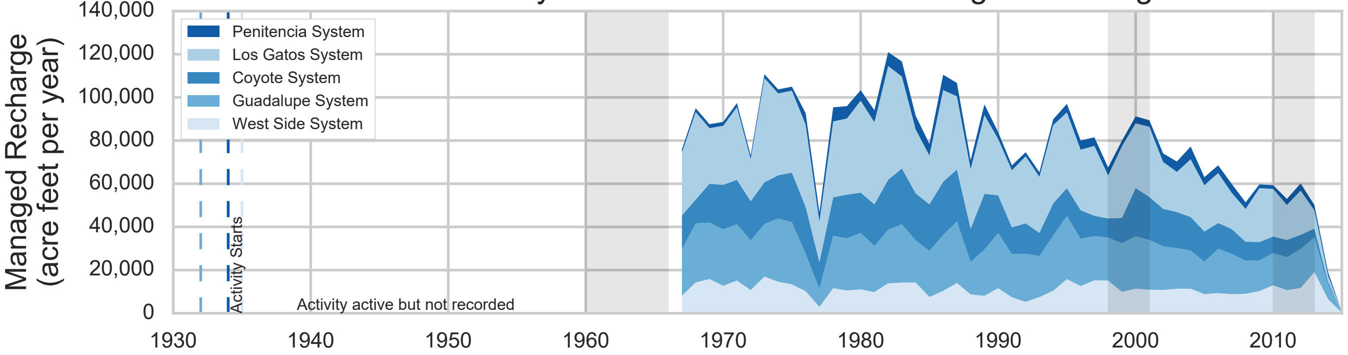
Cumulative Departure from Mean Annual Precipitation



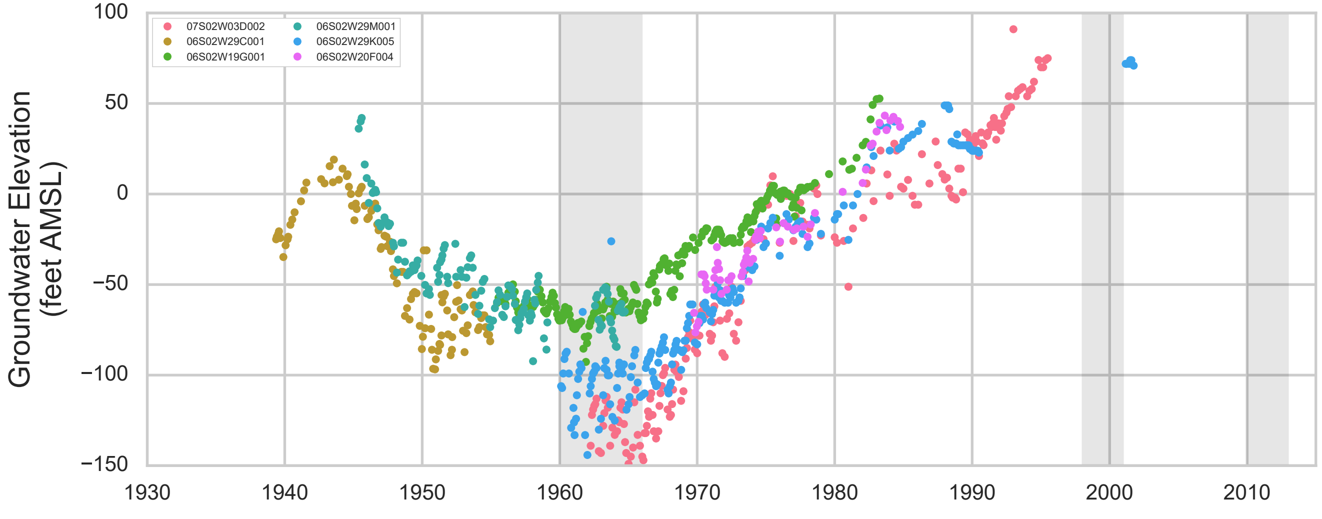
Groundwater Pumping in Cal Water Los Altos: GW Area



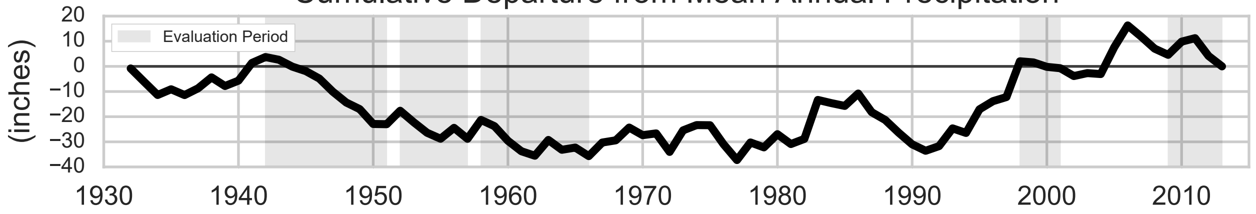
District Activity: Santa Clara Subbasin Managed Recharge

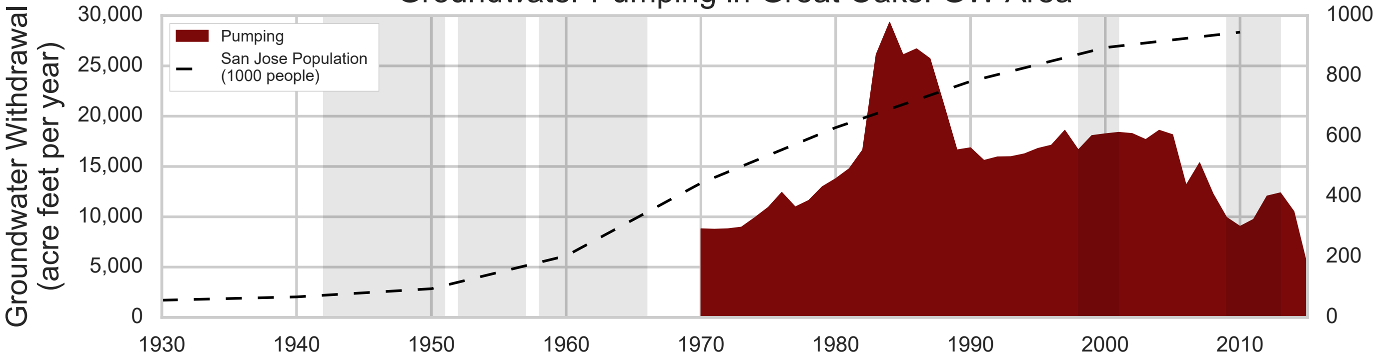


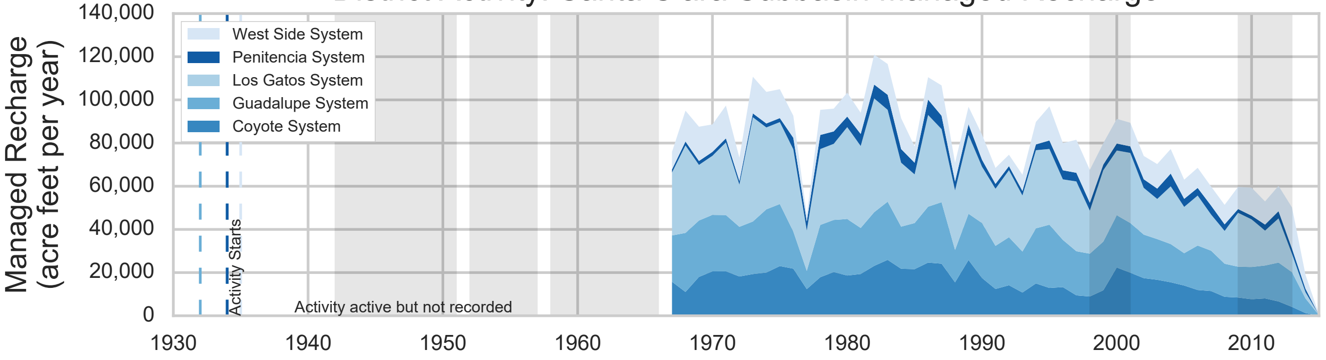
Observed Groundwater Elevations in Cal Water Los Altos: GW Area

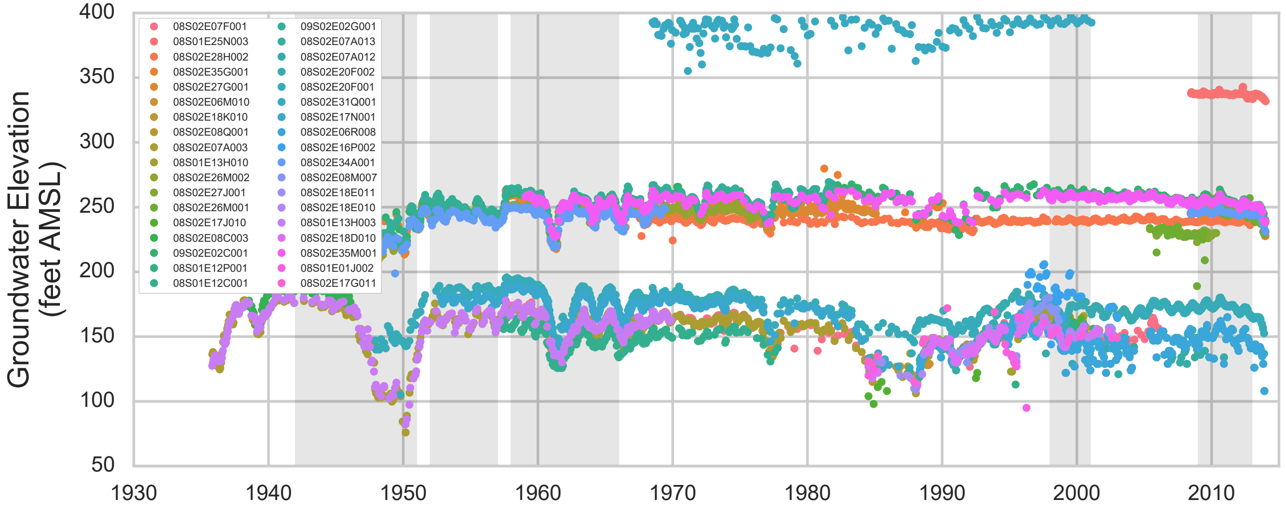


Pumping Area: Great Oaks: GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells


Cumulative Departure from Mean Annual Precipitation

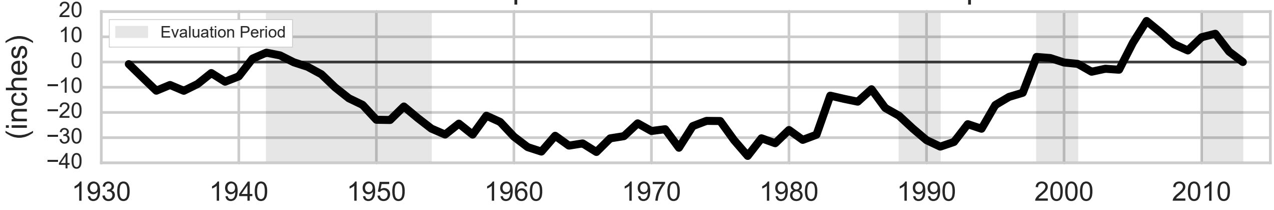

Groundwater Pumping in Great Oaks: GW Area


District Activity: Santa Clara Subbasin Managed Recharge

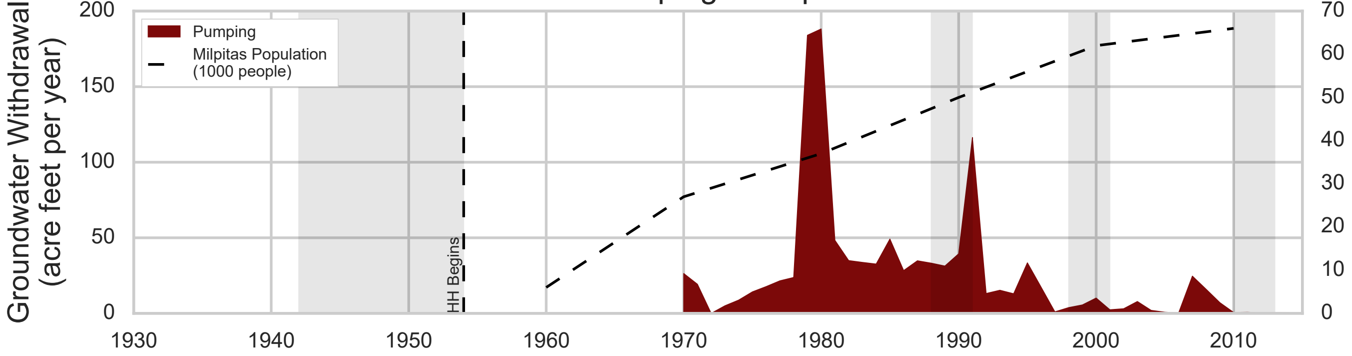

Observed Groundwater Elevations in Great Oaks: GW Area

Pumping Area: Milpitas: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

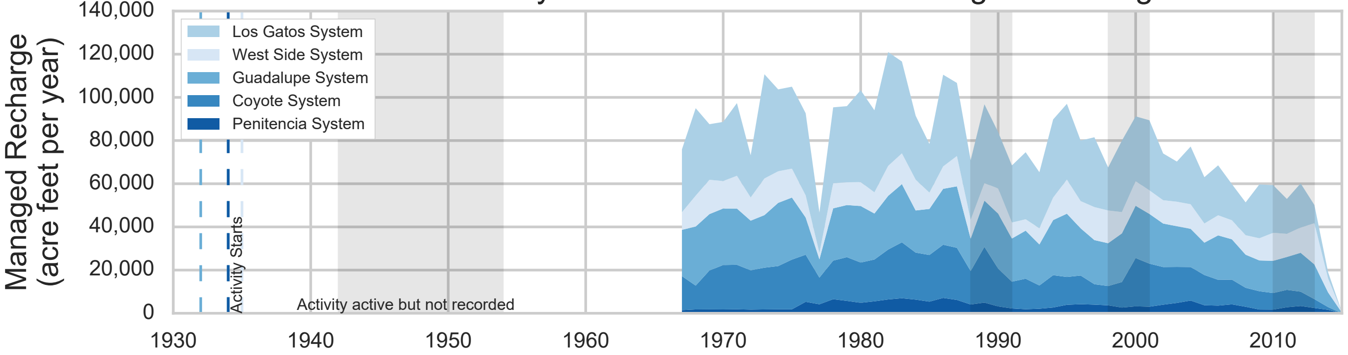
Cumulative Departure from Mean Annual Precipitation



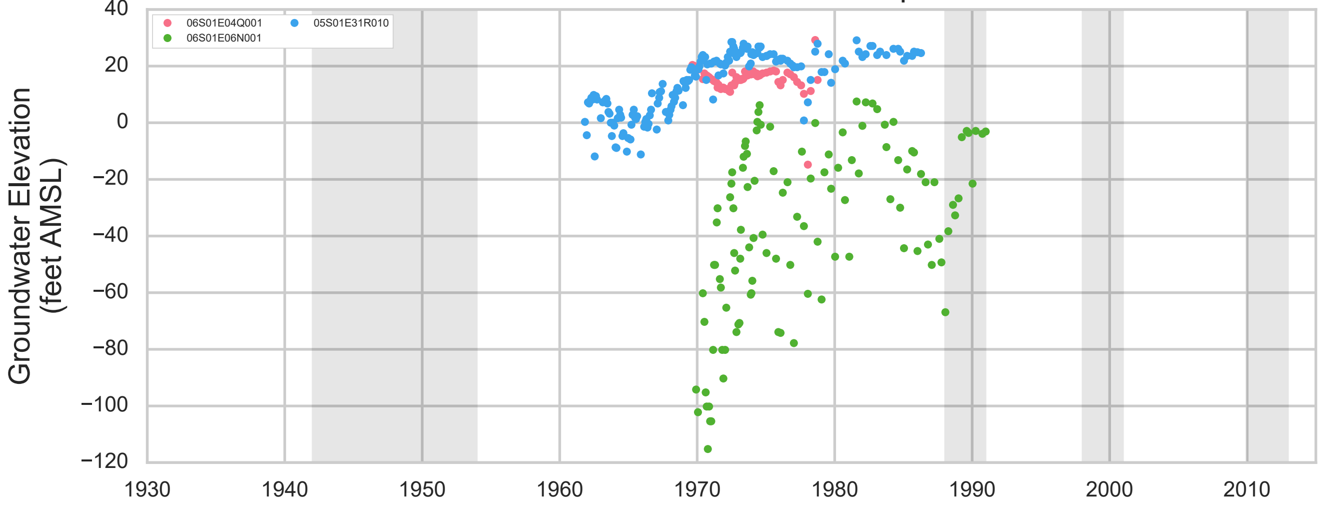
Groundwater Pumping in Milpitas: RWS Area



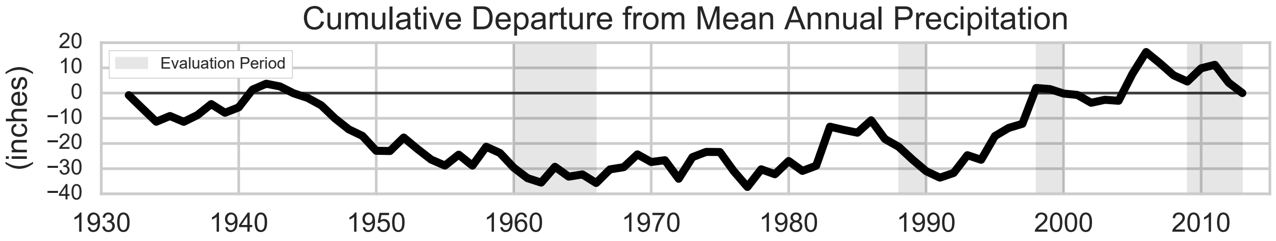
District Activity: Santa Clara Subbasin Managed Recharge

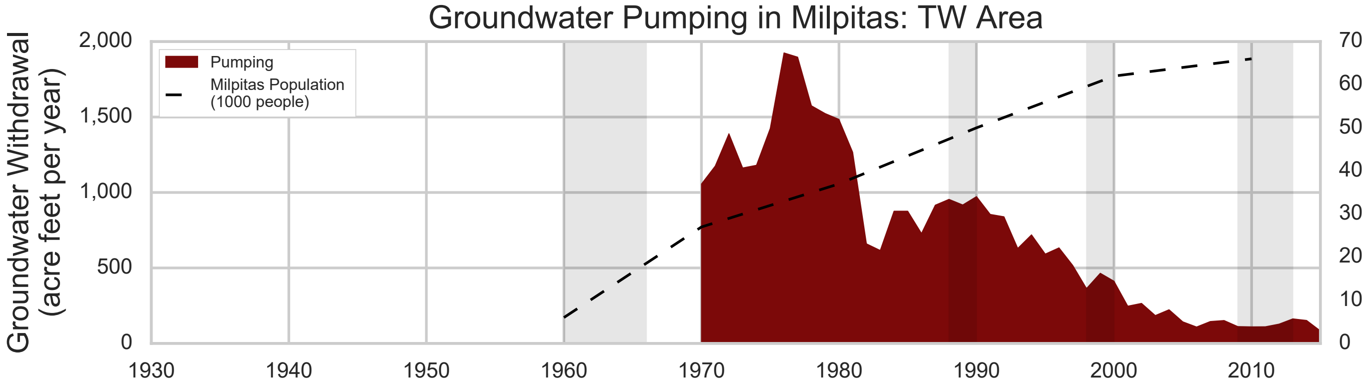


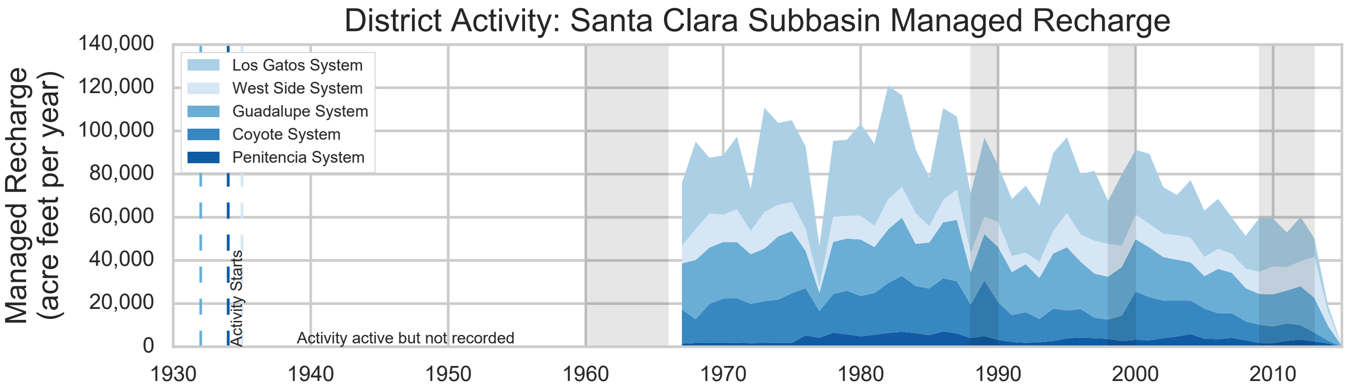
Observed Groundwater Elevations in Milpitas: RWS Area

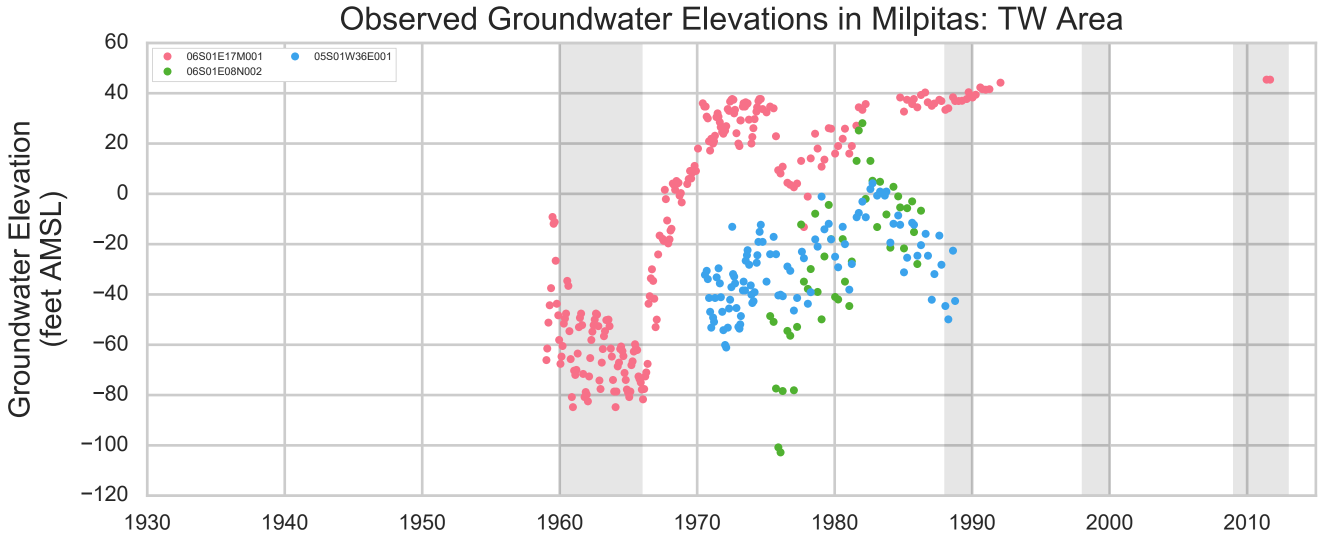


Pumping Area: Milpitas: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

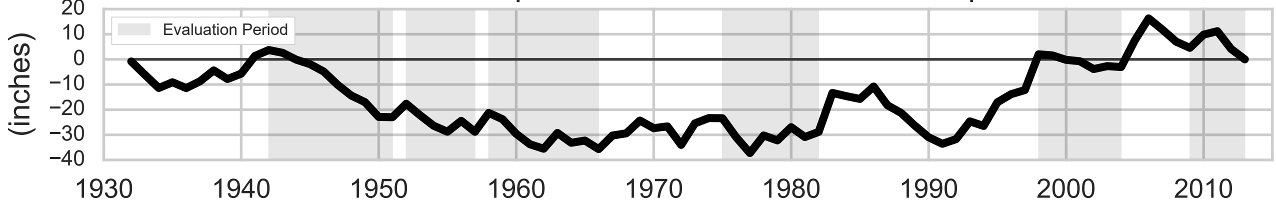

Cumulative Departure from Mean Annual Precipitation


Groundwater Pumping in Milpitas: TW Area

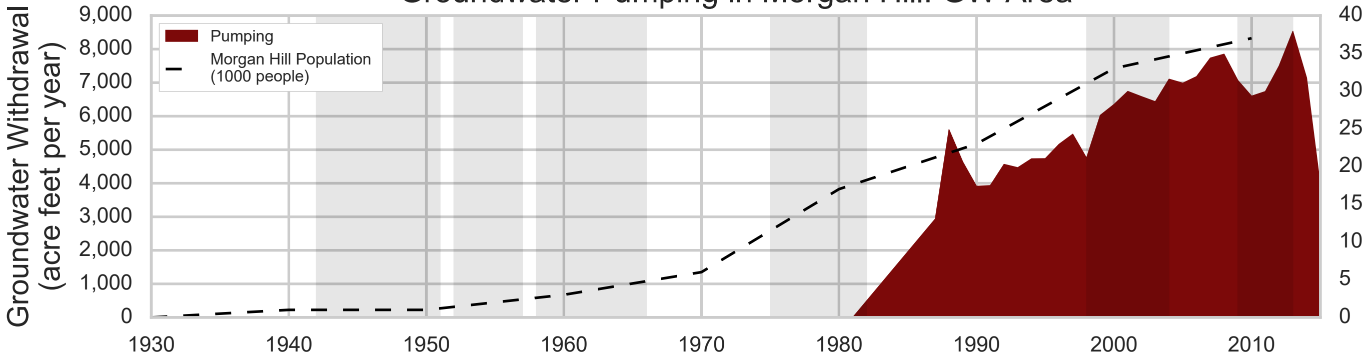

District Activity: Santa Clara Subbasin Managed Recharge


Observed Groundwater Elevations in Milpitas: TW Area

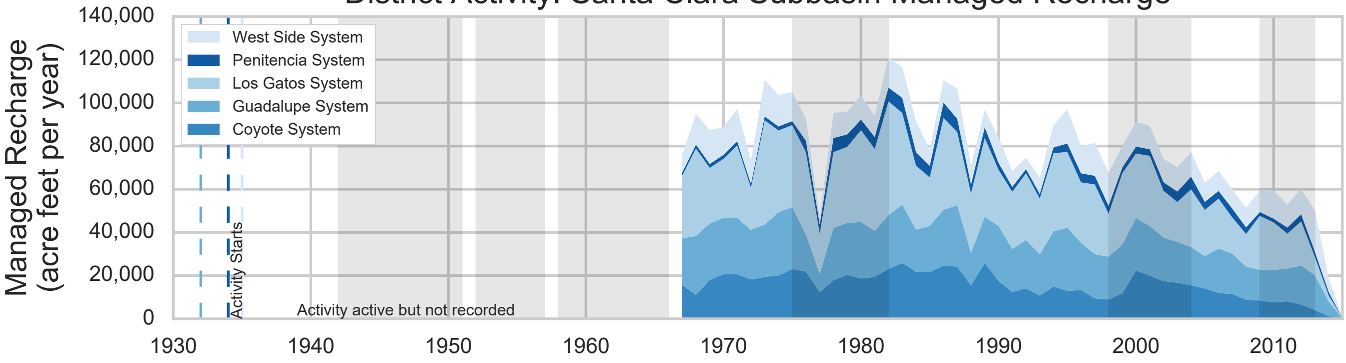
Pumping Area: Morgan Hill: GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells



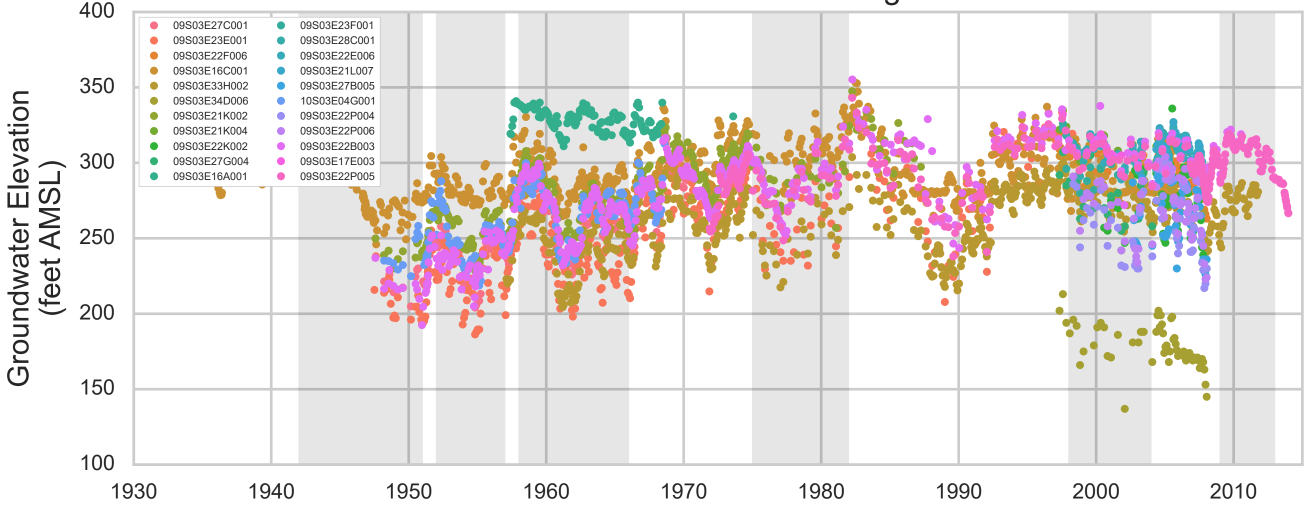
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Morgan Hill: GW Area



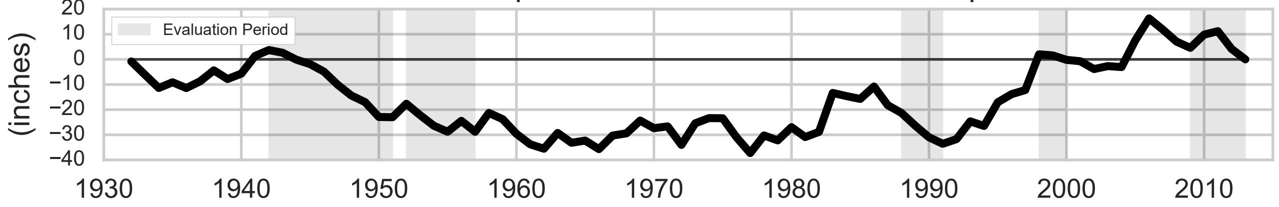
District Activity: Santa Clara Subbasin Managed Recharge



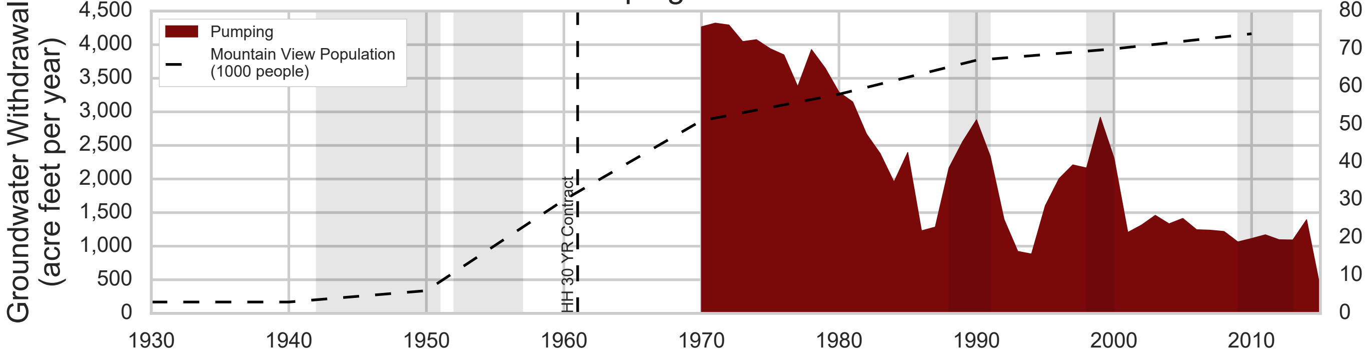
Observed Groundwater Elevations in Morgan Hill: GW Area

Pumping Area: Mountain View: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

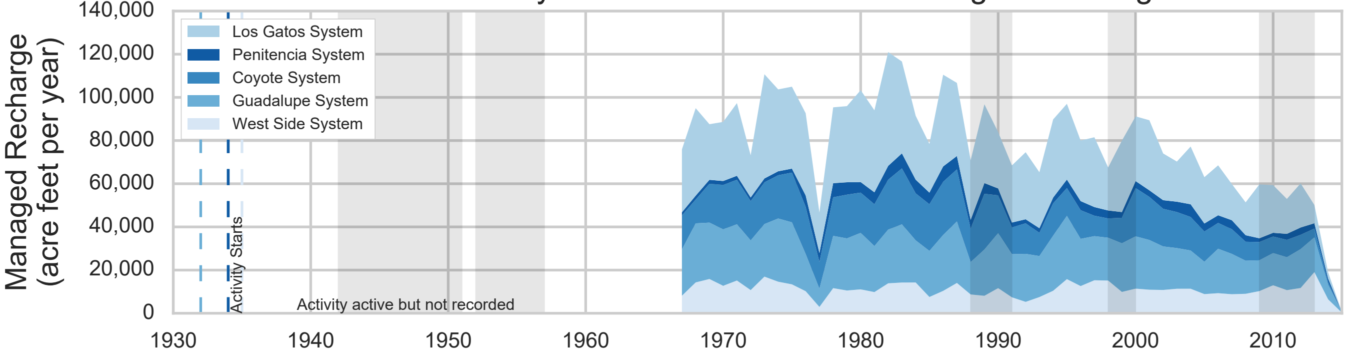
Cumulative Departure from Mean Annual Precipitation



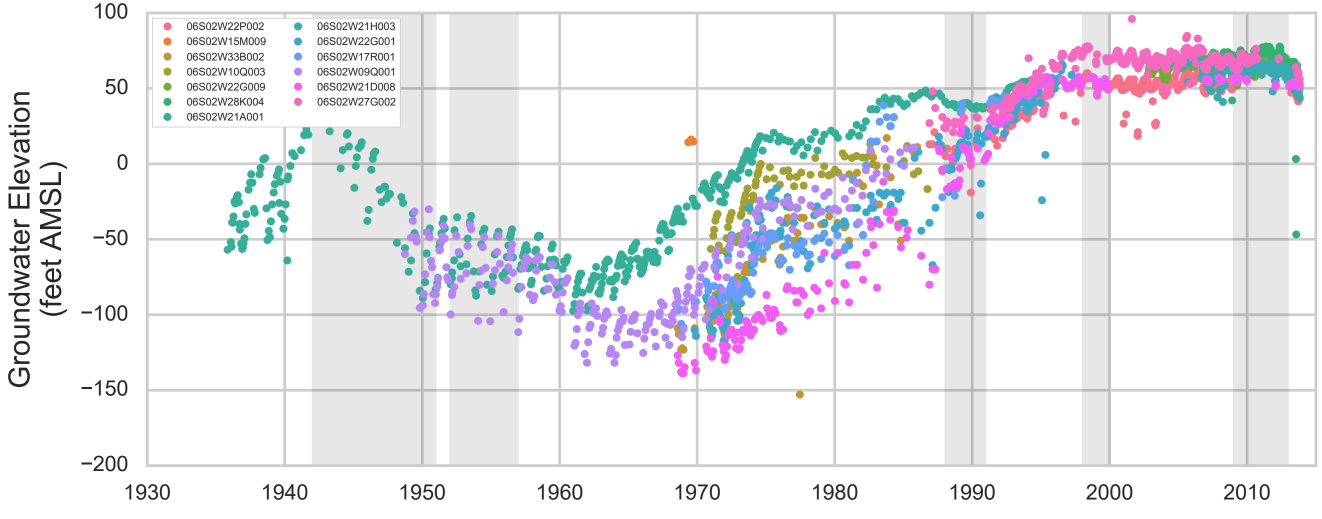
Groundwater Pumping in Mountain View: RWS Area



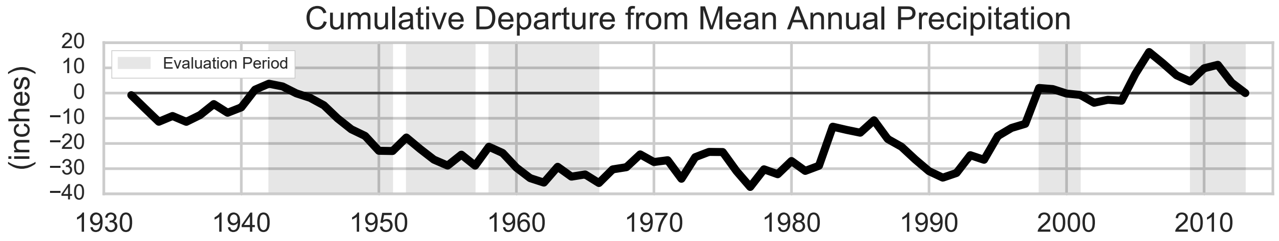
District Activity: Santa Clara Subbasin Managed Recharge

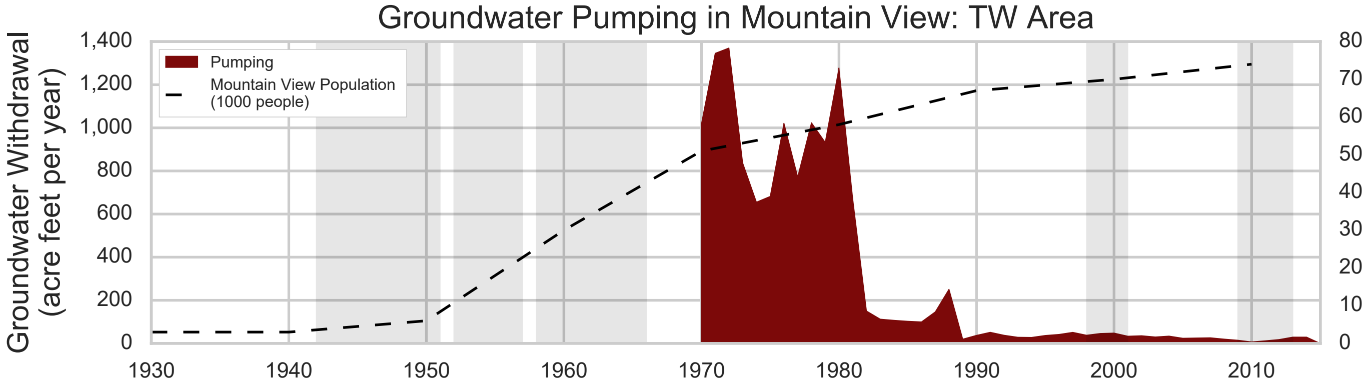


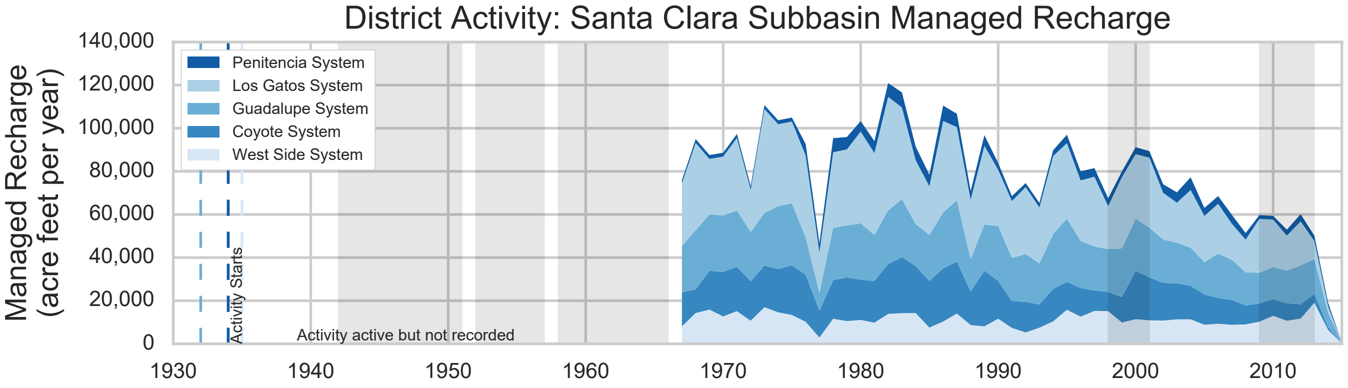
Observed Groundwater Elevations in Mountain View: RWS Area

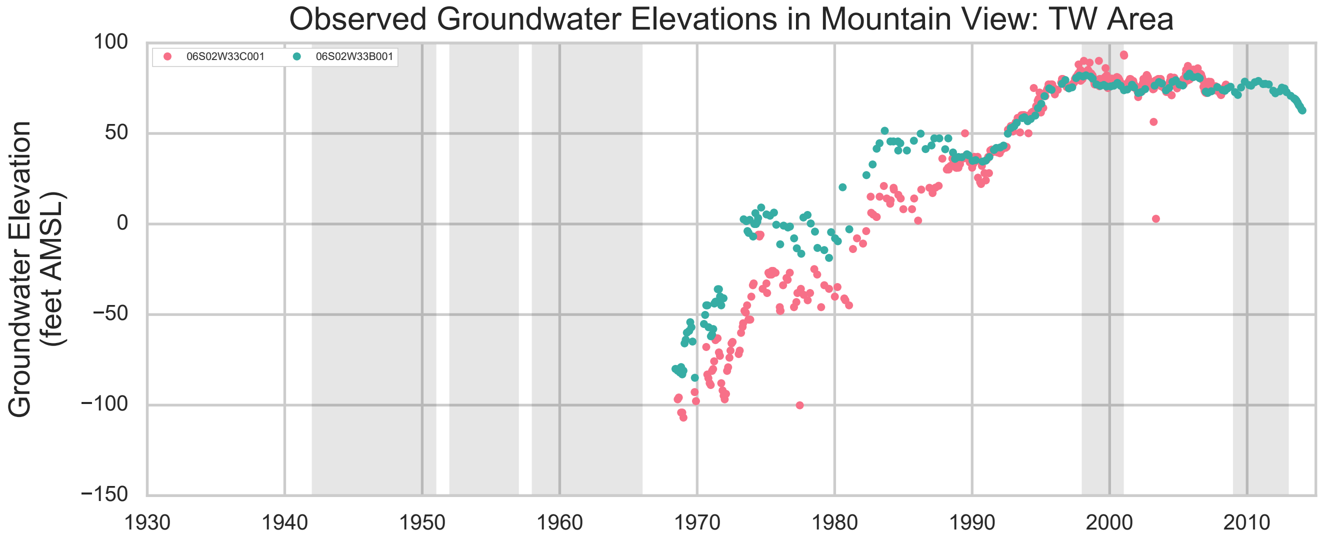


Pumping Area: Mountain View: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells


Cumulative Departure from Mean Annual Precipitation

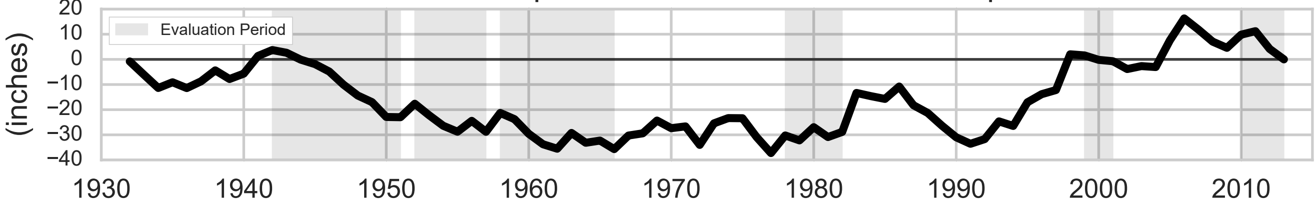

Groundwater Pumping in Mountain View: TW Area


District Activity: Santa Clara Subbasin Managed Recharge

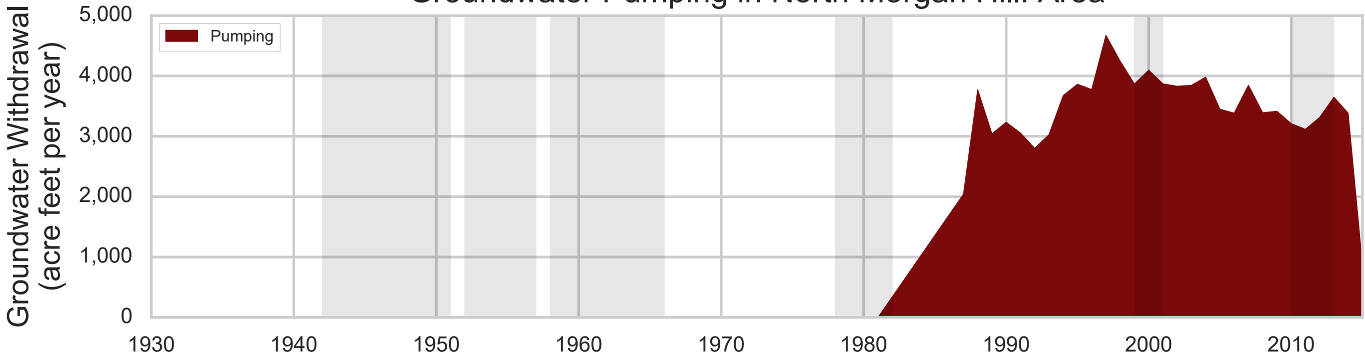

Observed Groundwater Elevations in Mountain View: TW Area

Pumping Area: North Morgan Hill:
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

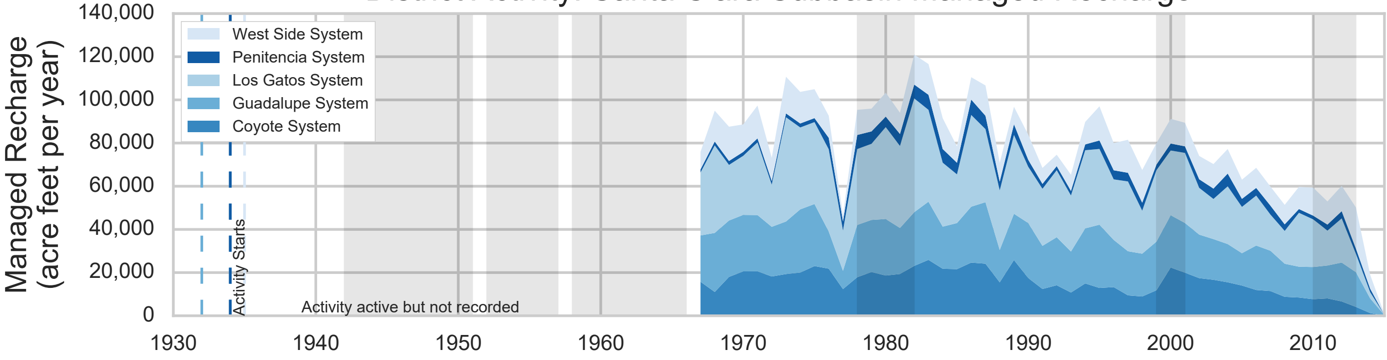
Cumulative Departure from Mean Annual Precipitation



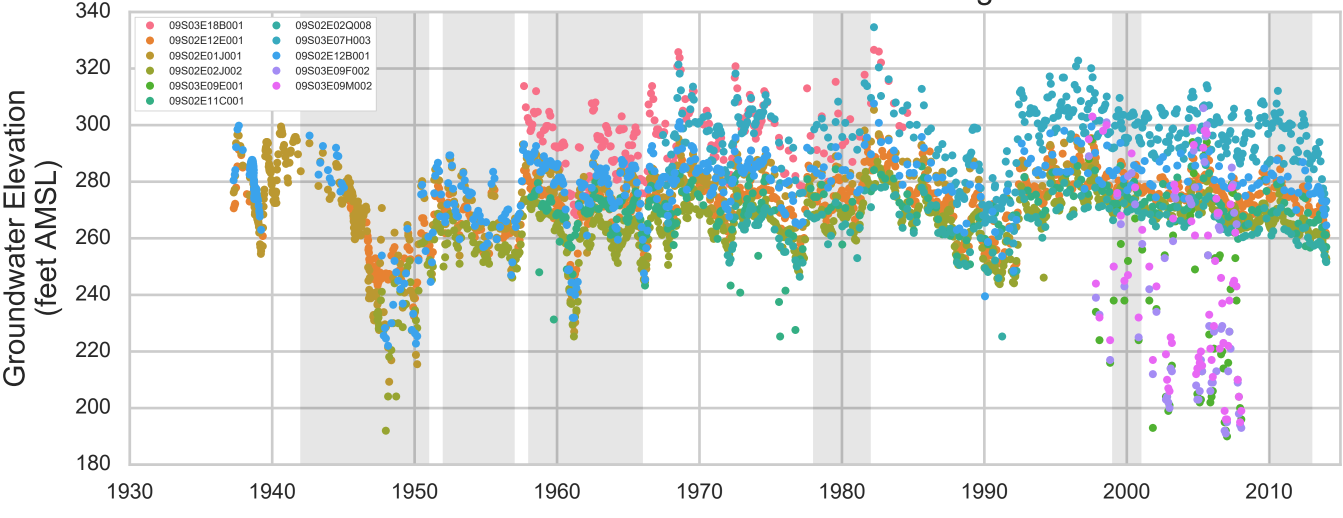
Groundwater Pumping in North Morgan Hill: Area



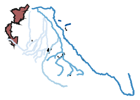
District Activity: Santa Clara Subbasin Managed Recharge

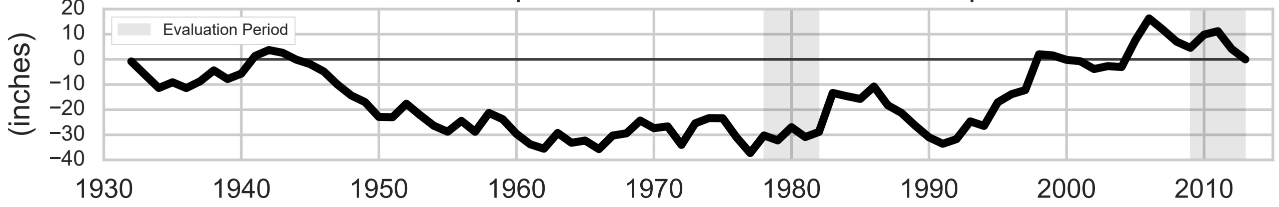


Observed Groundwater Elevations in North Morgan Hill: Area

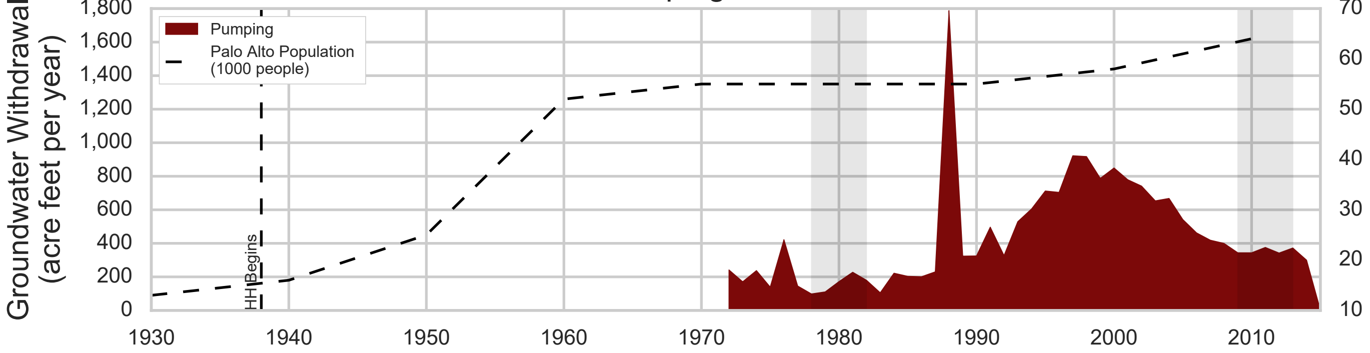


Pumping Area: Palo Alto: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

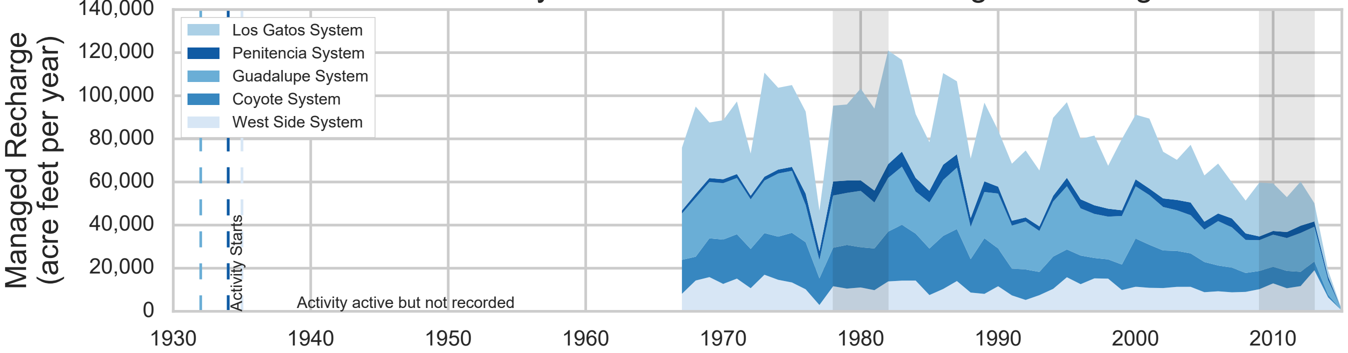




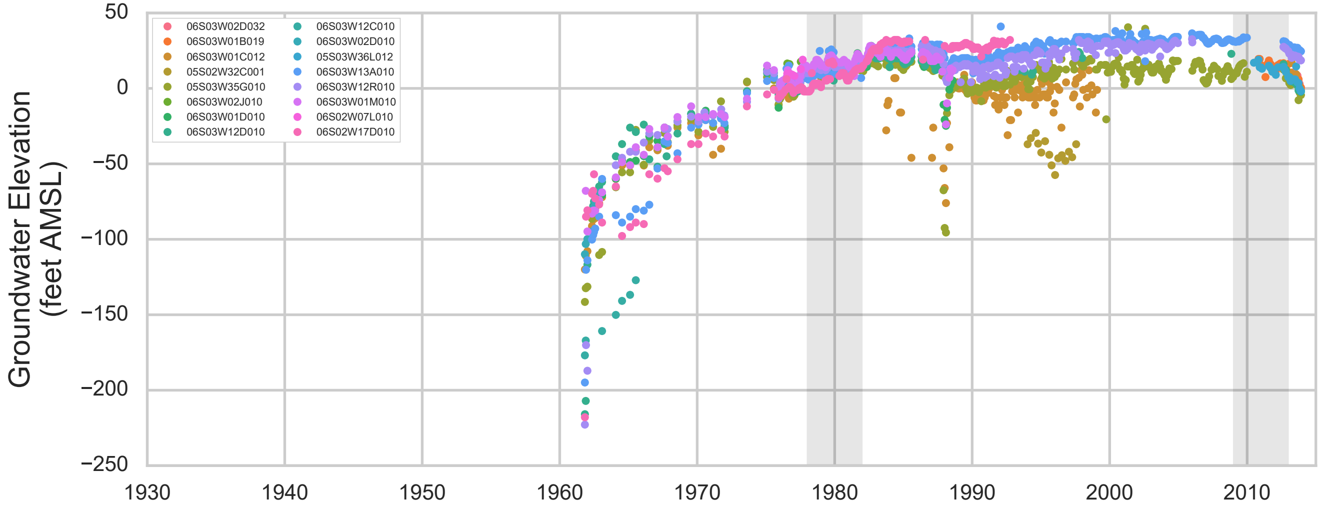
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Palo Alto: RWS Area

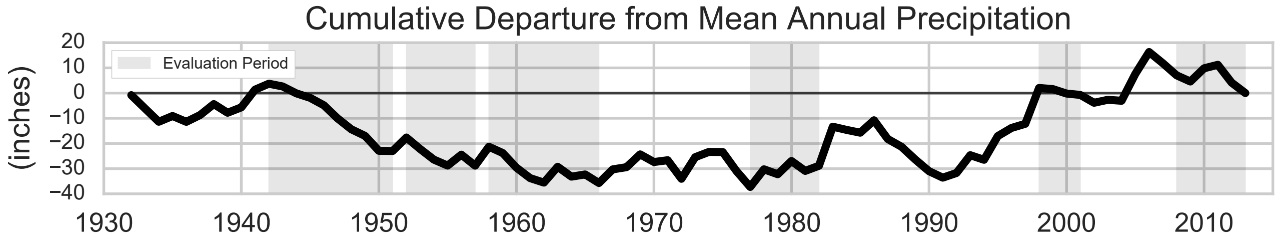


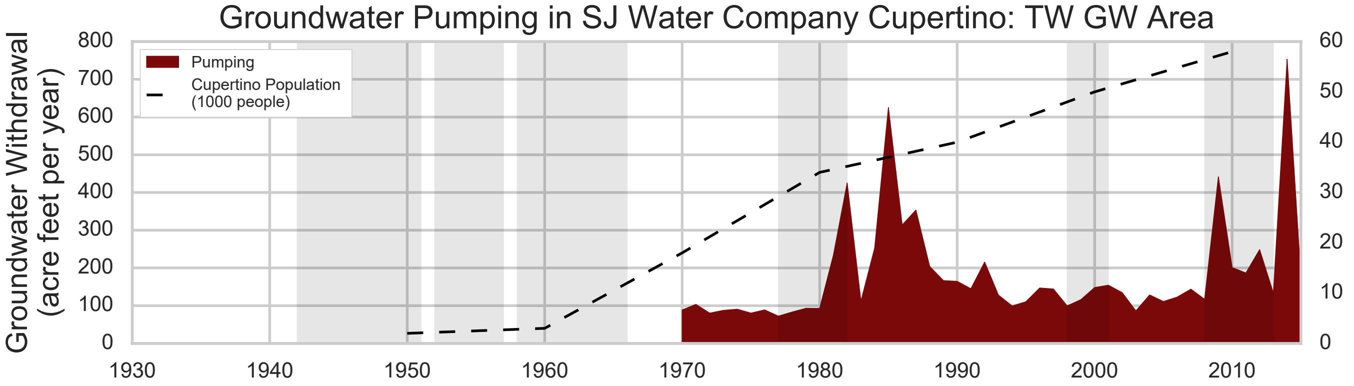
District Activity: Santa Clara Subbasin Managed Recharge

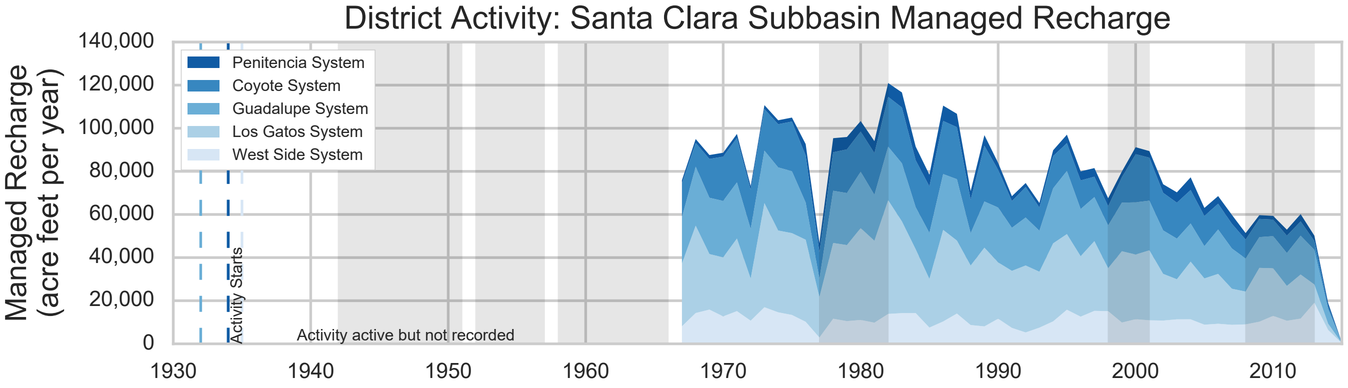


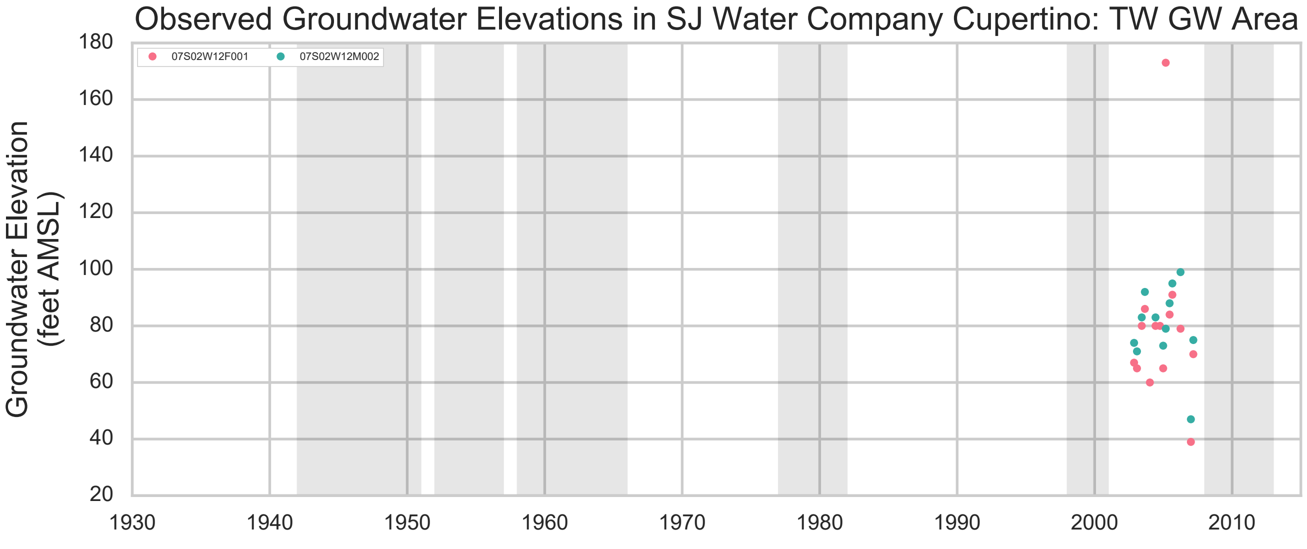
Observed Groundwater Elevations in Palo Alto: RWS Area

Pumping Area: SJ Water Company Cupertino: TW GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

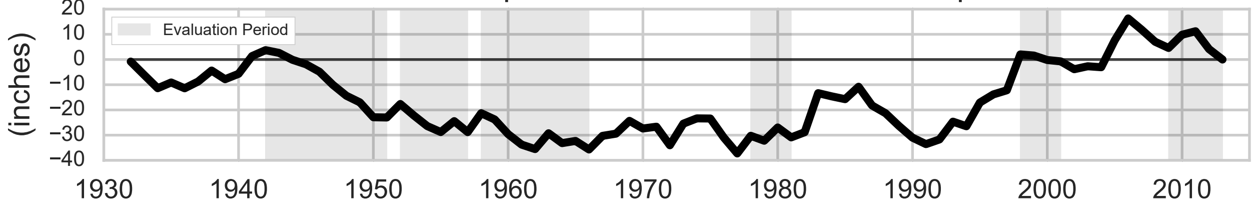

Cumulative Departure from Mean Annual Precipitation

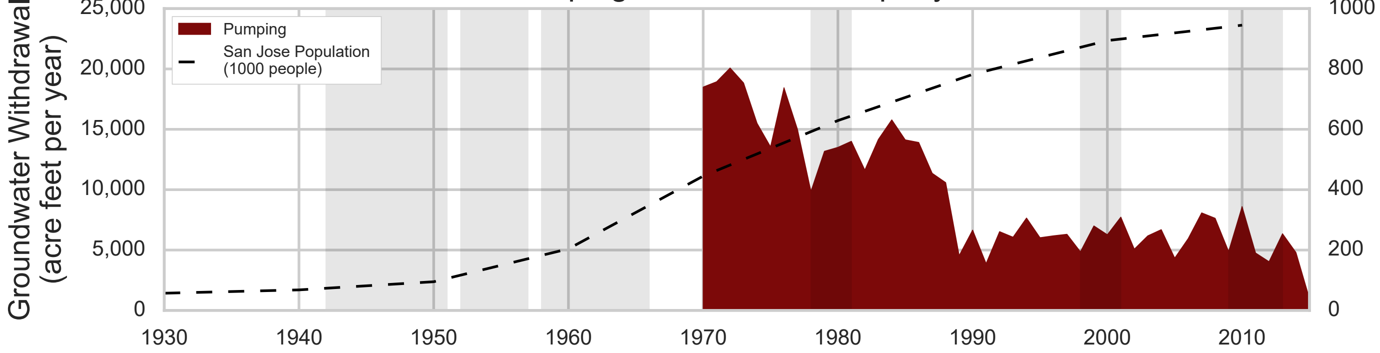

Groundwater Pumping in SJ Water Company Cupertino: TW GW Area

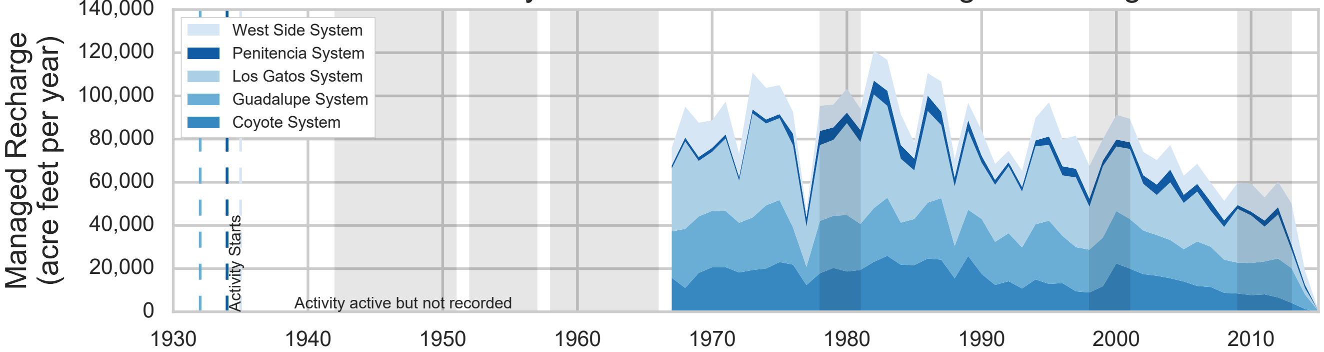

District Activity: Santa Clara Subbasin Managed Recharge

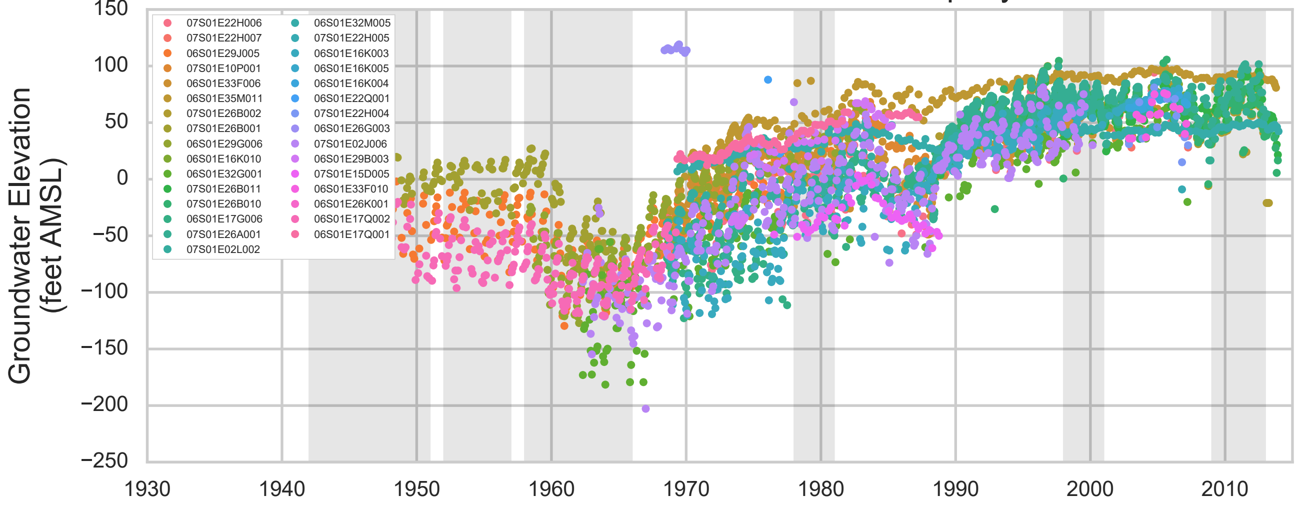

Observed Groundwater Elevations in SJ Water Company Cupertino: TW GW Area

Pumping Area: SJ Water Company East: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

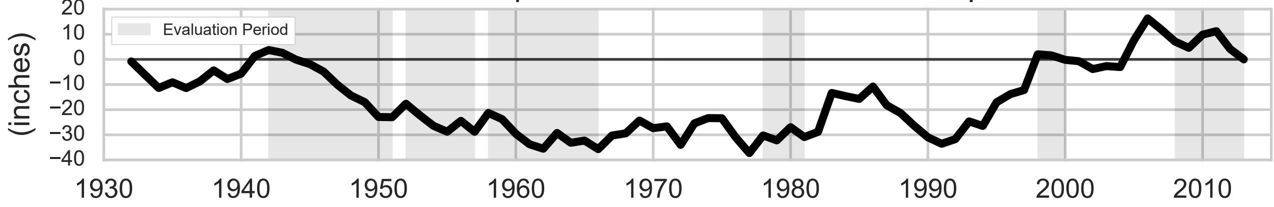

Cumulative Departure from Mean Annual Precipitation

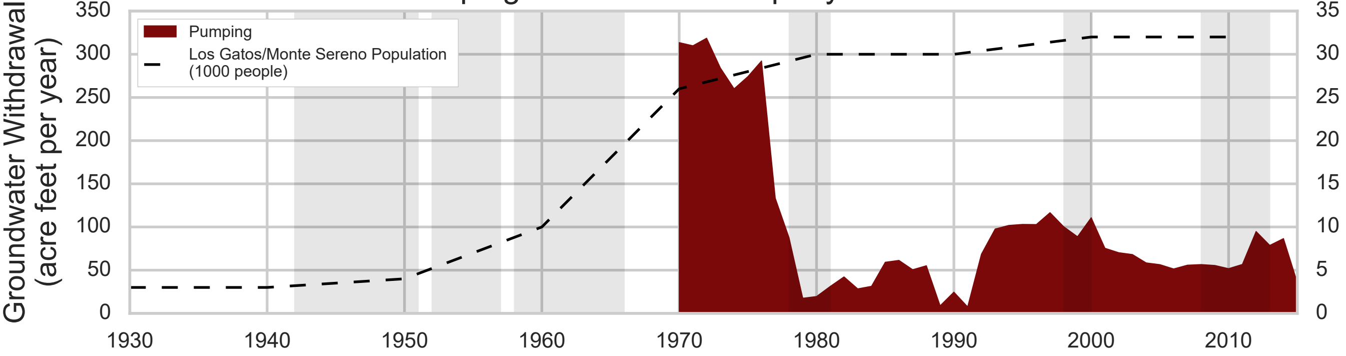

Groundwater Pumping in SJ Water Company East: TW Area

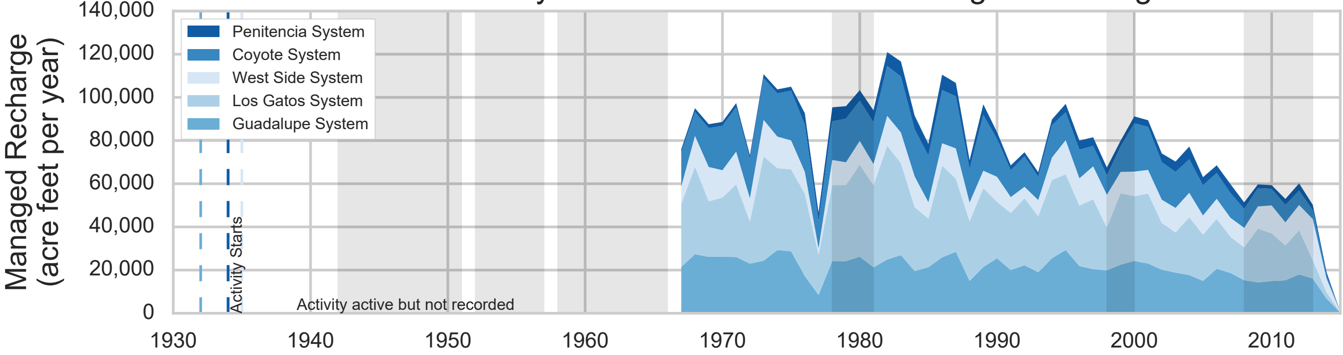

District Activity: Santa Clara Subbasin Managed Recharge

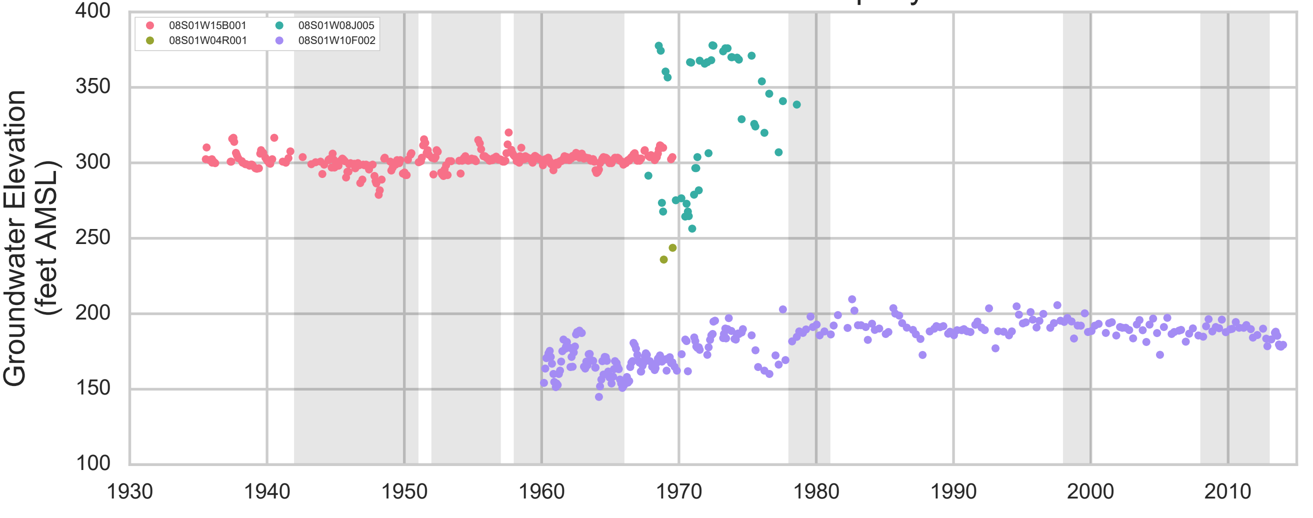

Observed Groundwater Elevations in SJ Water Company East: TW Area

Pumping Area: SJ Water Company Los Gatos: Local SW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

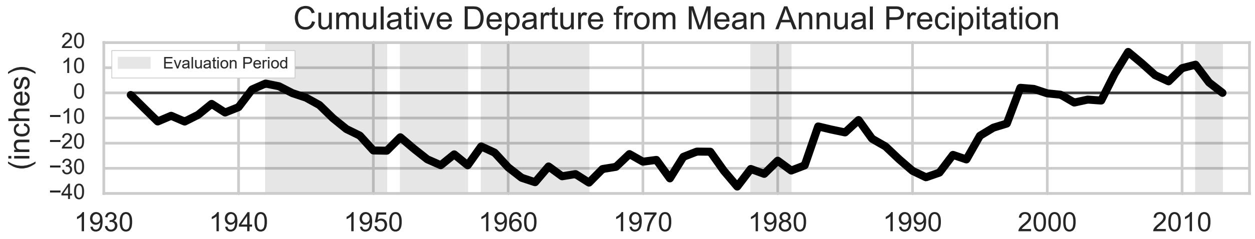

Cumulative Departure from Mean Annual Precipitation

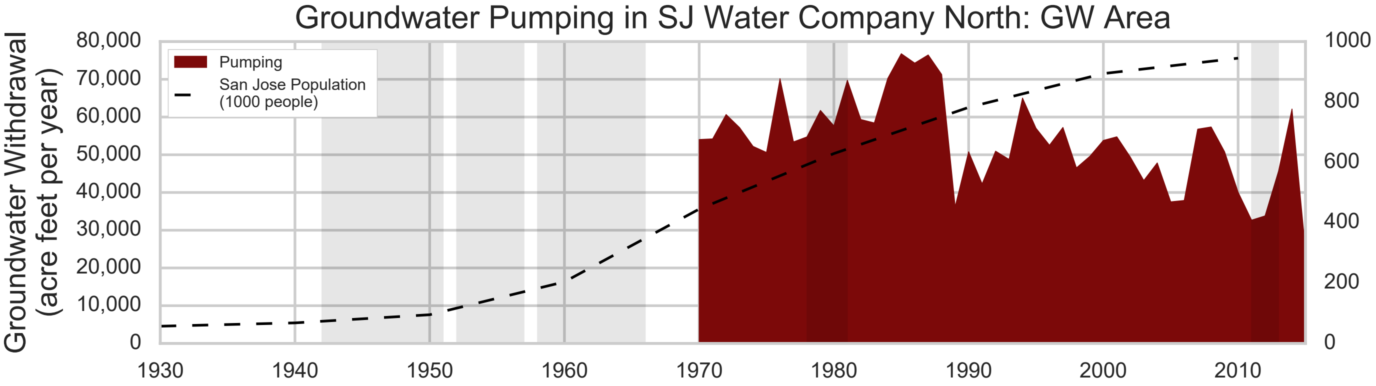

Groundwater Pumping in SJ Water Company Los Gatos: Local SW Area

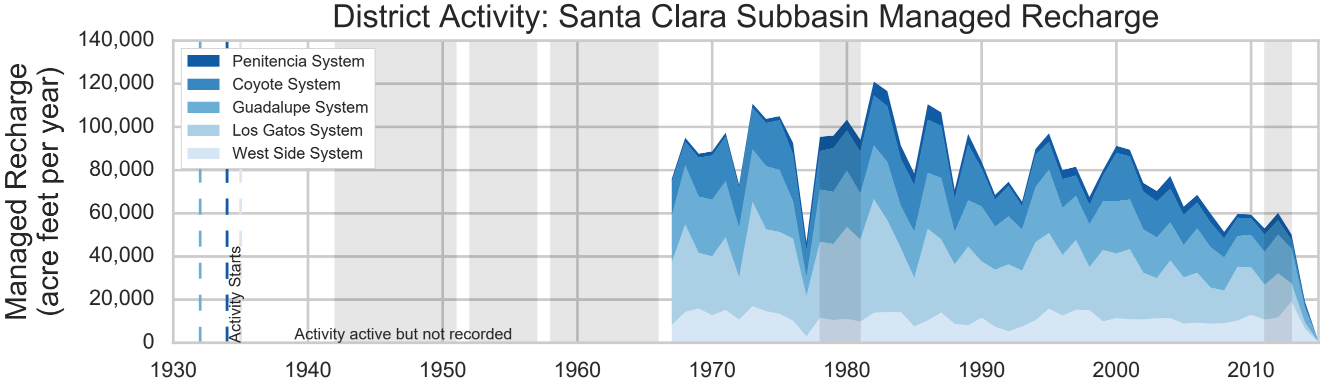

District Activity: Santa Clara Subbasin Managed Recharge

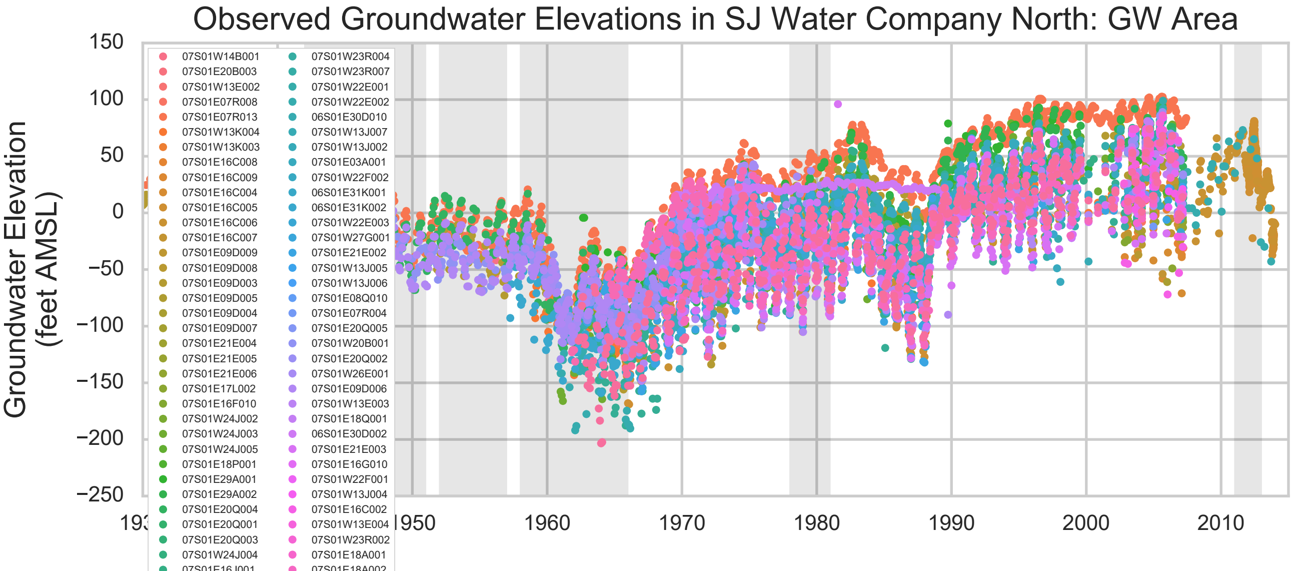

Observed Groundwater Elevations in SJ Water Company Los Gatos: Local SW Area

Pumping Area: SJ Water Company North: GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells


Cumulative Departure from Mean Annual Precipitation

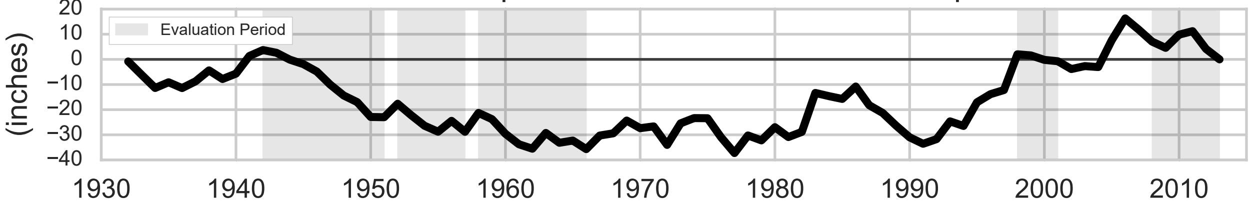

Groundwater Pumping in SJ Water Company North: GW Area


District Activity: Santa Clara Subbasin Managed Recharge

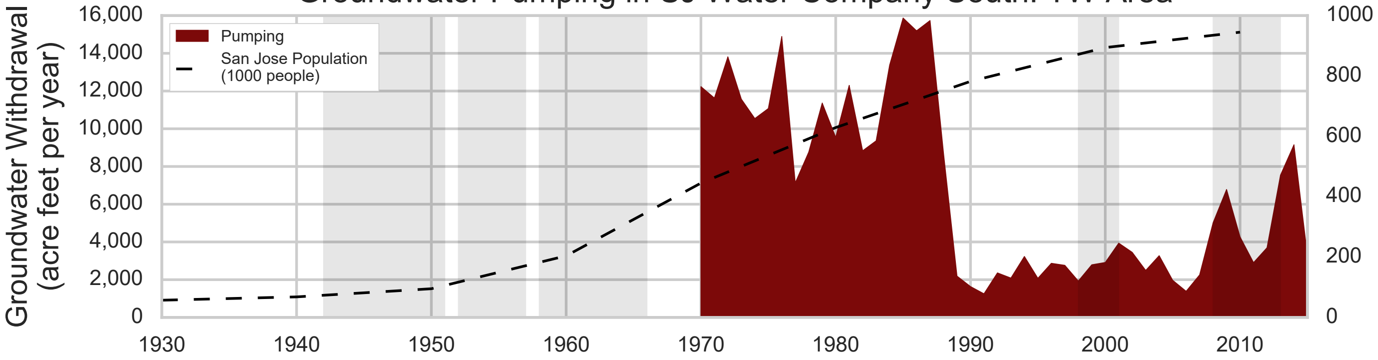

Observed Groundwater Elevations in SJ Water Company North: GW Area

Pumping Area: SJ Water Company South: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

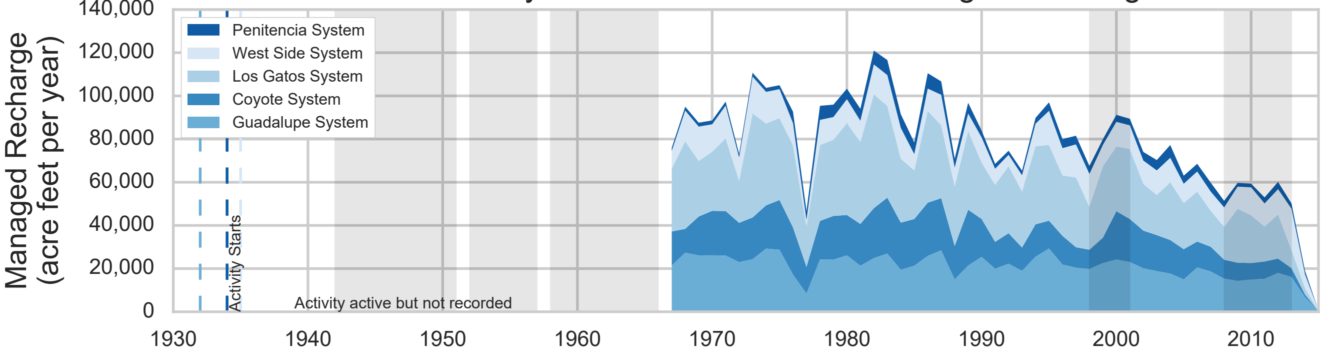
Cumulative Departure from Mean Annual Precipitation



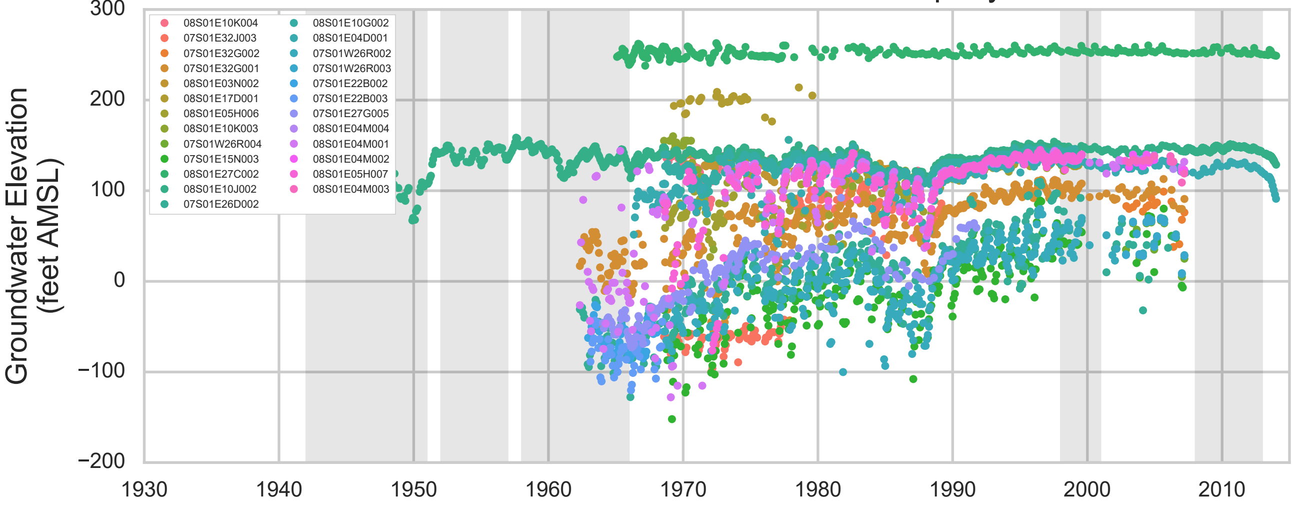
Groundwater Pumping in SJ Water Company South: TW Area



District Activity: Santa Clara Subbasin Managed Recharge

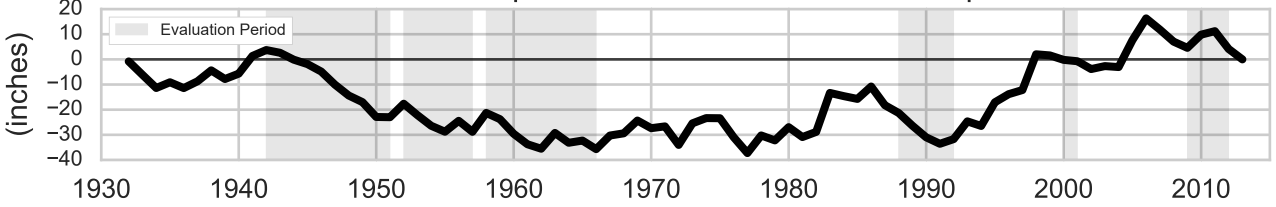


Observed Groundwater Elevations in SJ Water Company South: TW Area

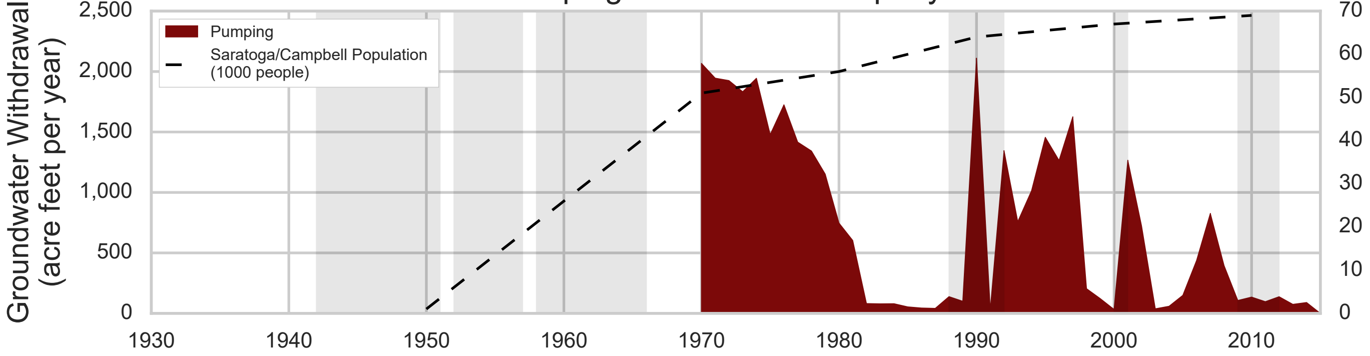


Pumping Area: SJ Water Company West: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

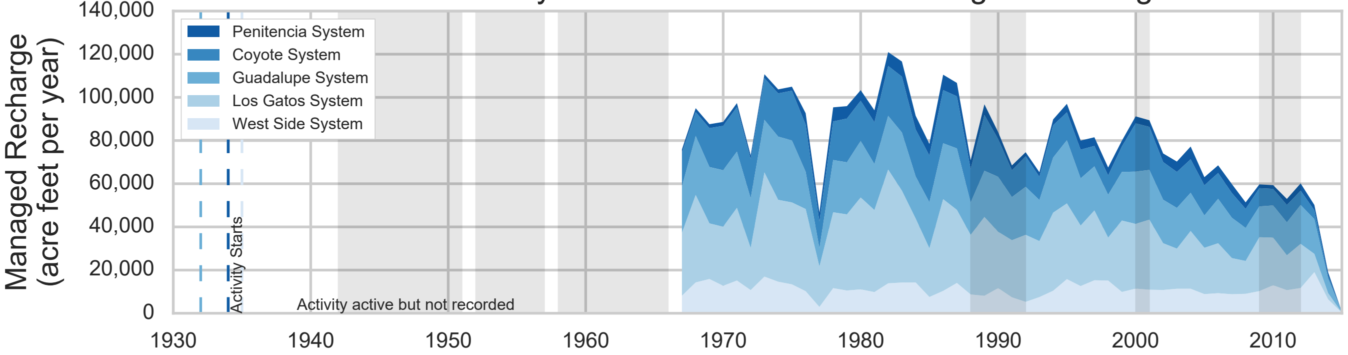
Cumulative Departure from Mean Annual Precipitation



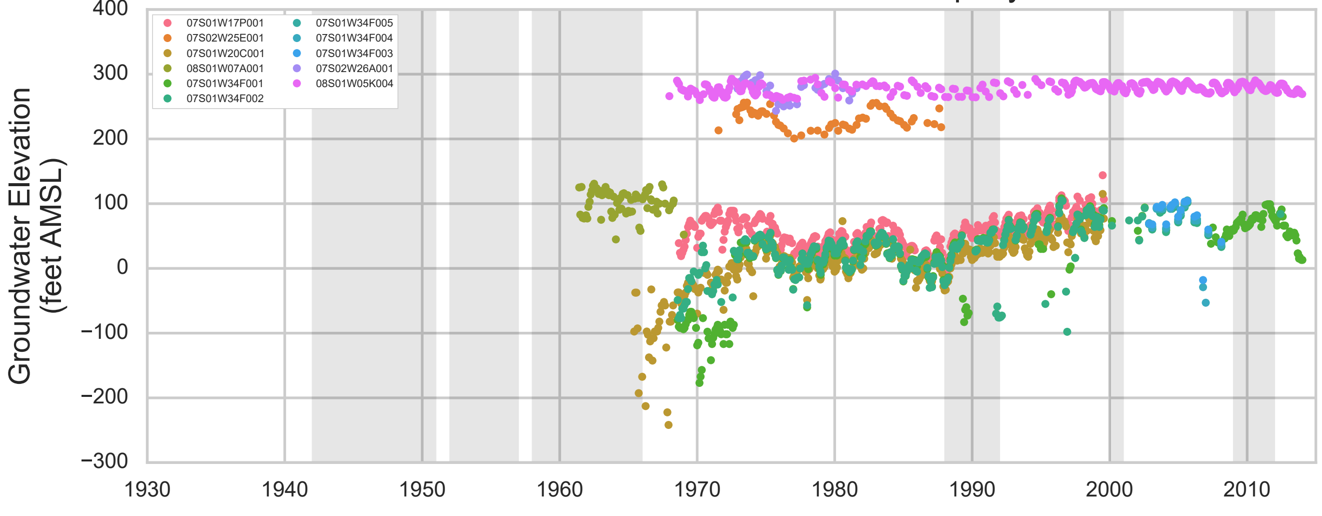
Groundwater Pumping in SJ Water Company West: TW Area



District Activity: Santa Clara Subbasin Managed Recharge

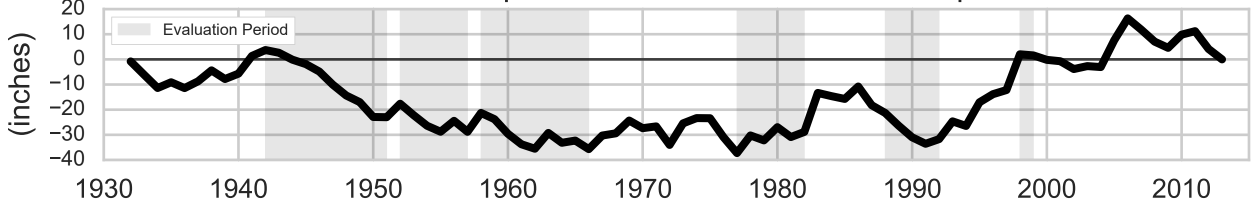


Observed Groundwater Elevations in SJ Water Company West: TW Area

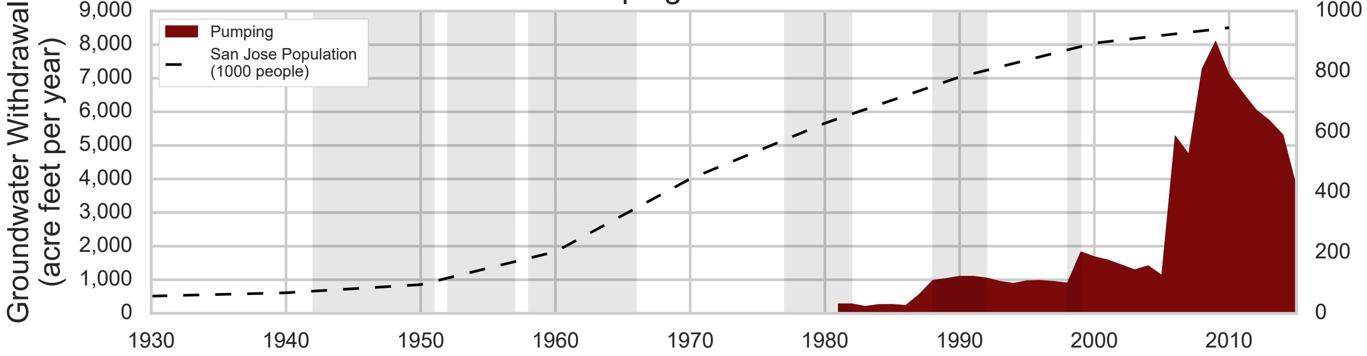


Pumping Area: San Jose Muni: GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

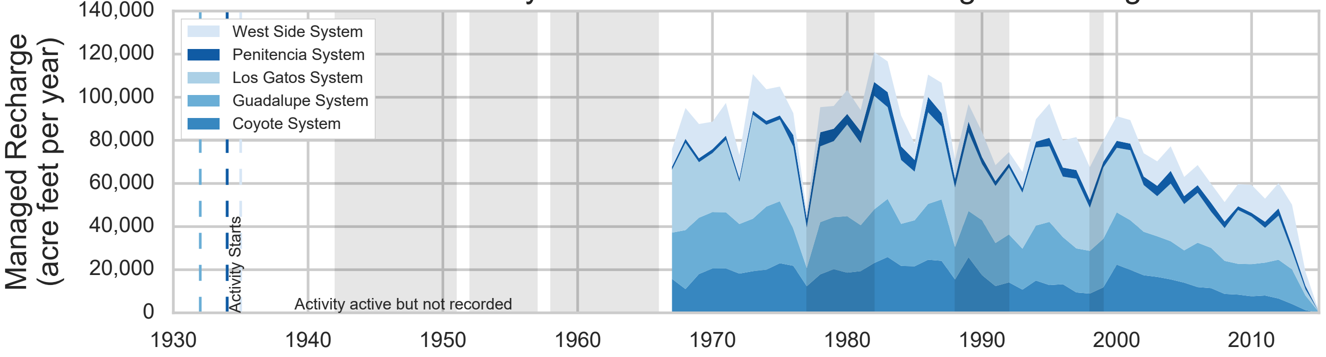
Cumulative Departure from Mean Annual Precipitation



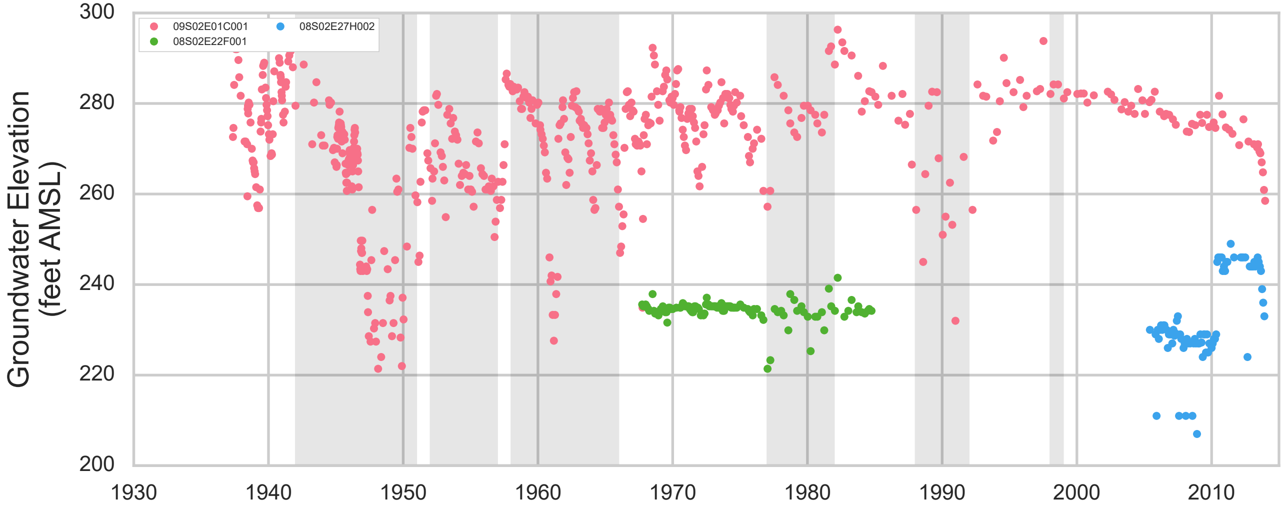
Groundwater Pumping in San Jose Muni: GW Area



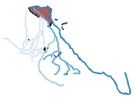
District Activity: Santa Clara Subbasin Managed Recharge



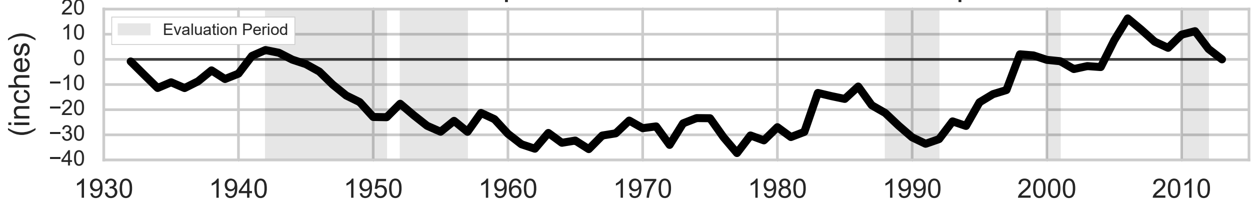
Observed Groundwater Elevations in San Jose Muni: GW Area



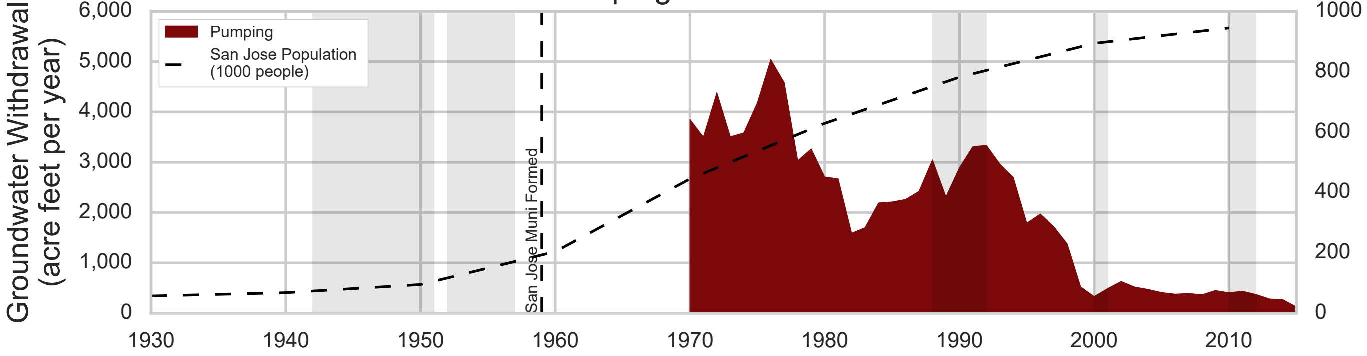
Pumping Area: San Jose Muni: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells



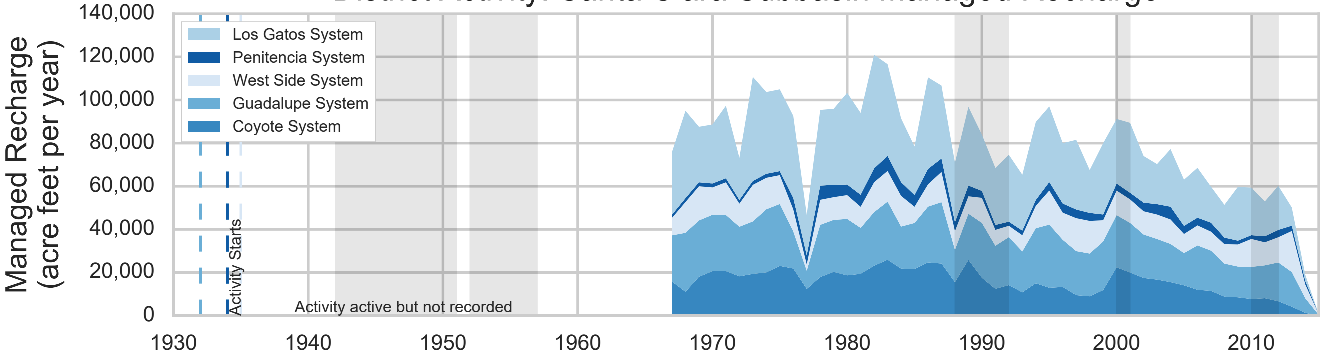
Cumulative Departure from Mean Annual Precipitation



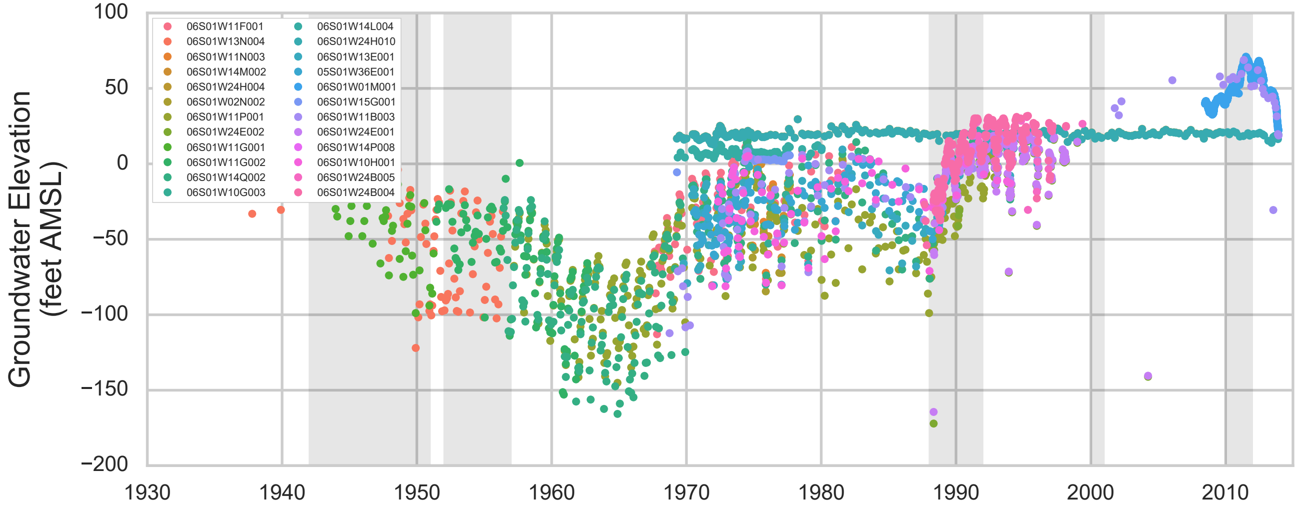
Groundwater Pumping in San Jose Muni: RWS Area



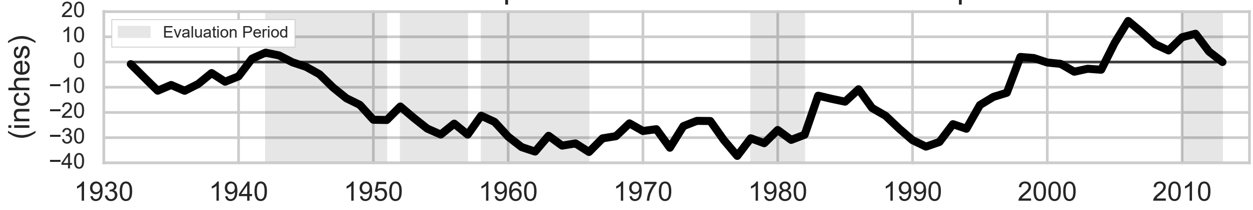
District Activity: Santa Clara Subbasin Managed Recharge



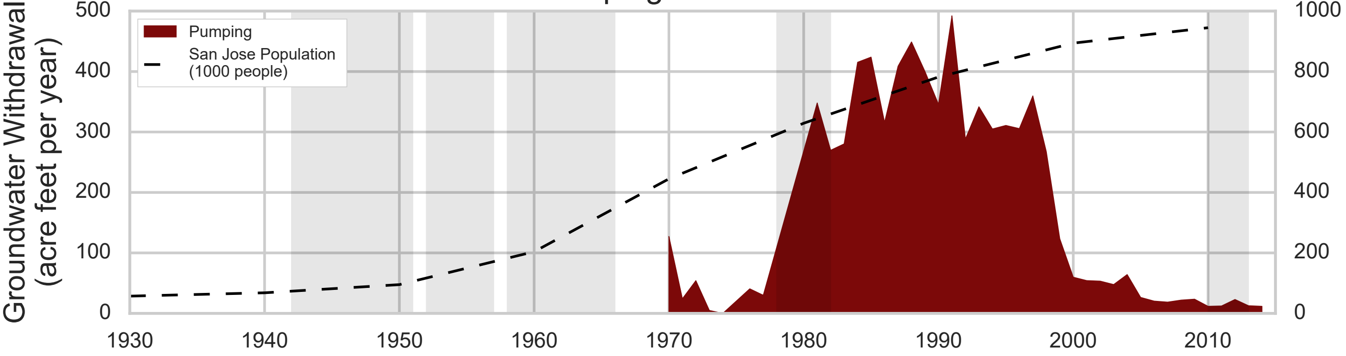
Observed Groundwater Elevations in San Jose Muni: RWS Area



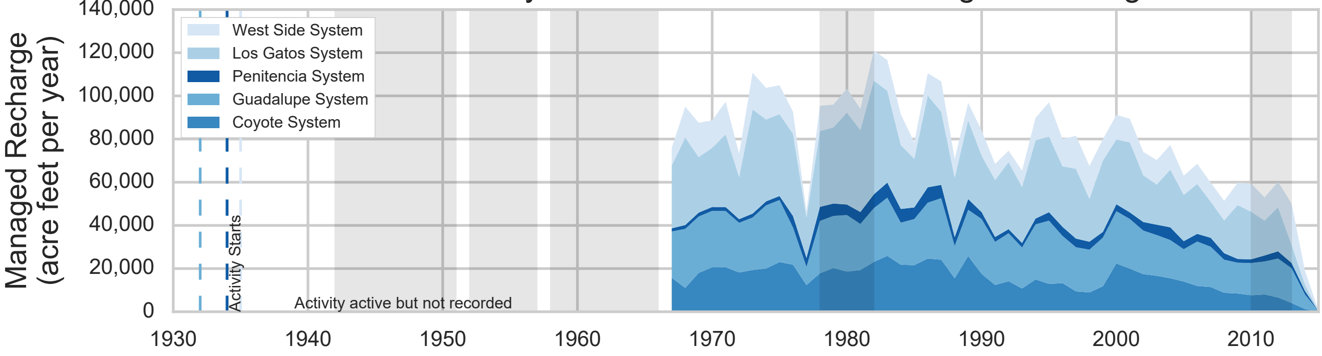
Pumping Area: San Jose Muni: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells



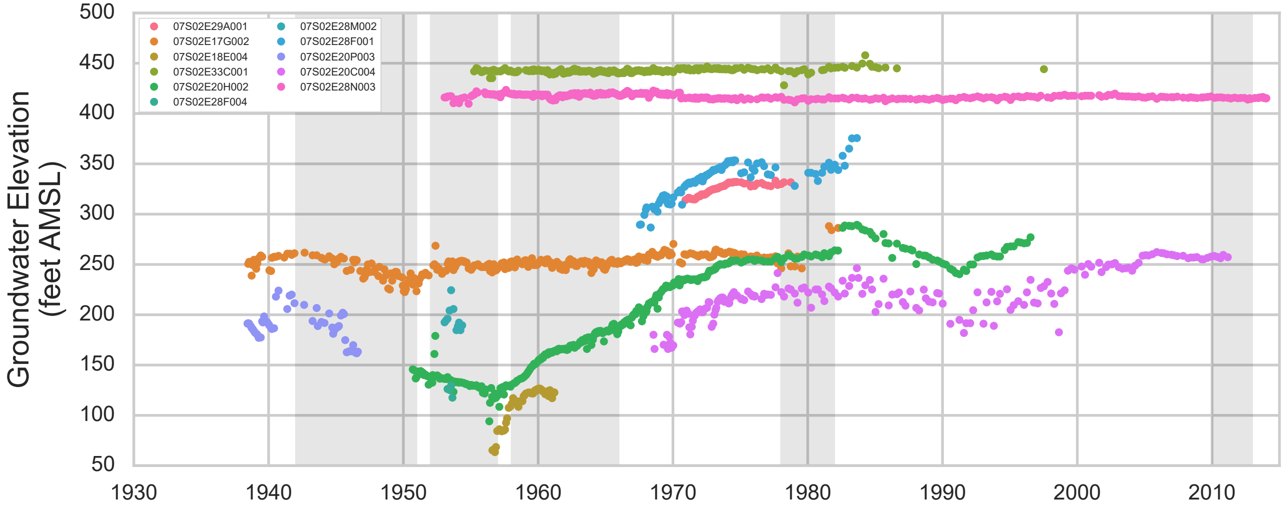
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in San Jose Muni: TW Area

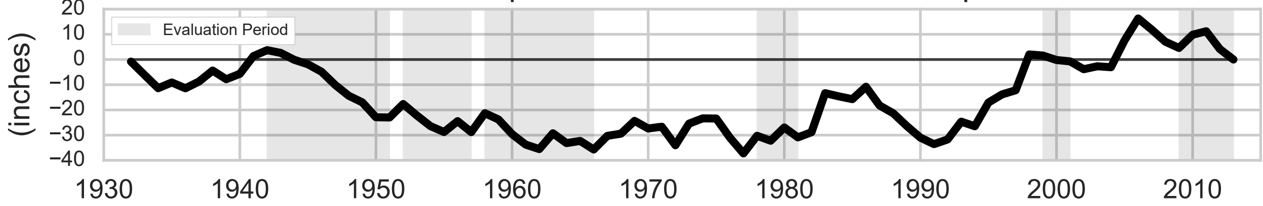


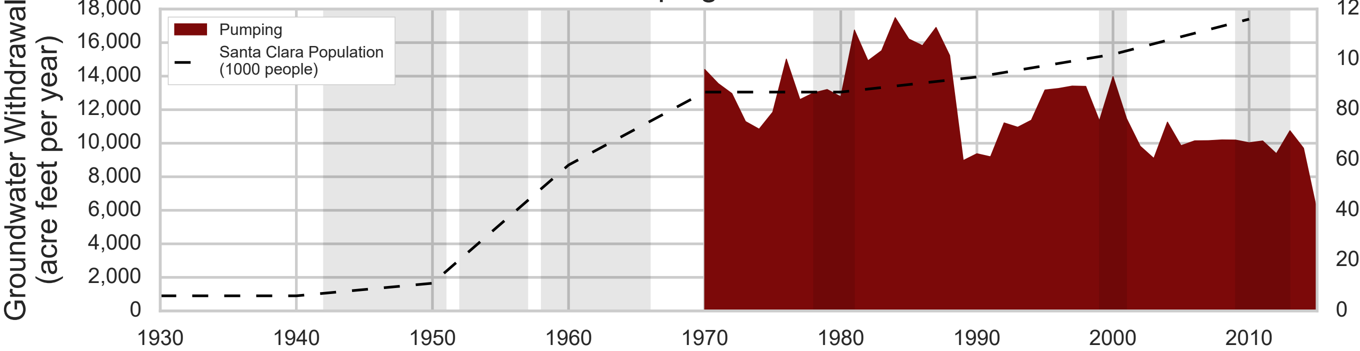
District Activity: Santa Clara Subbasin Managed Recharge

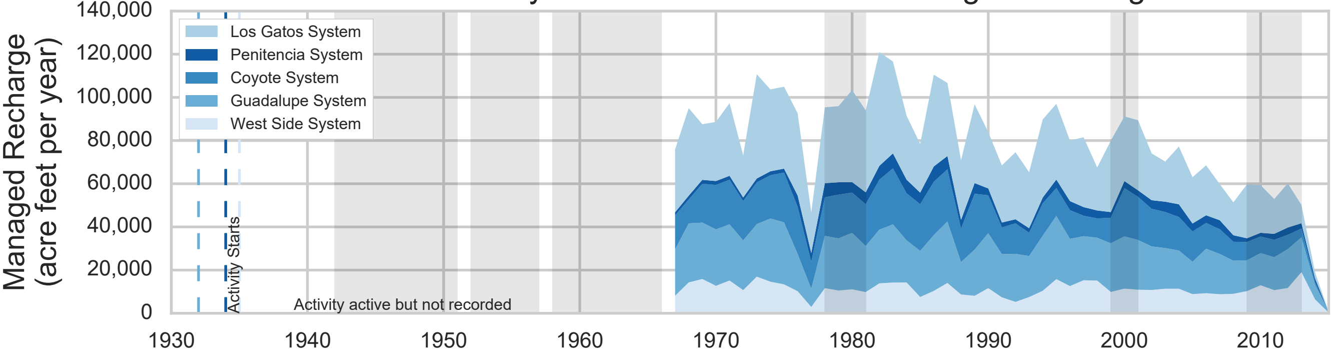


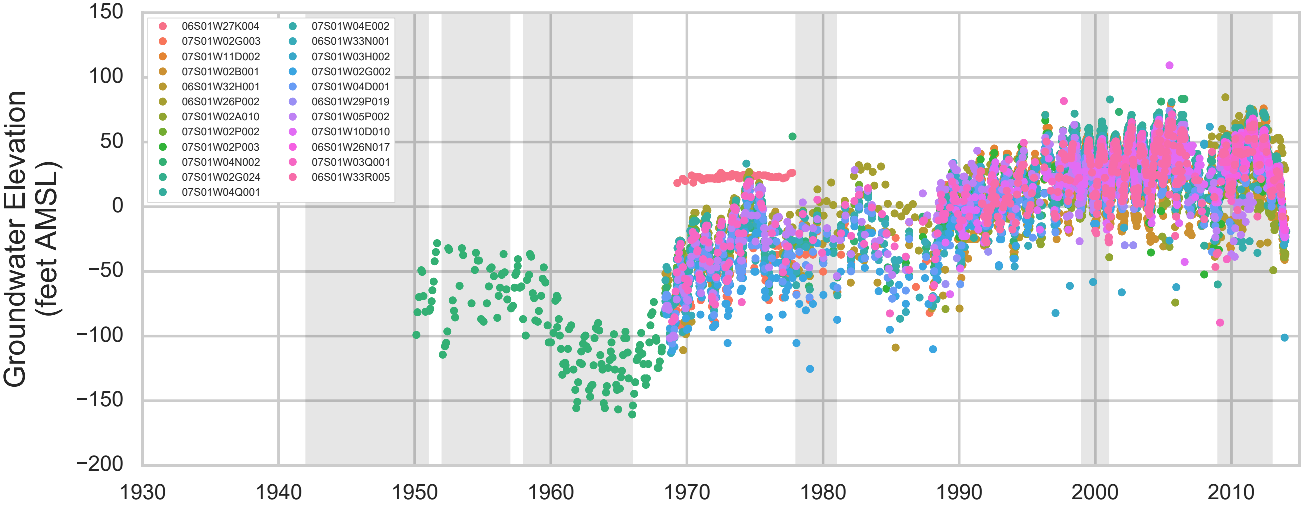
Observed Groundwater Elevations in San Jose Muni: TW Area

Pumping Area: Santa Clara: GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

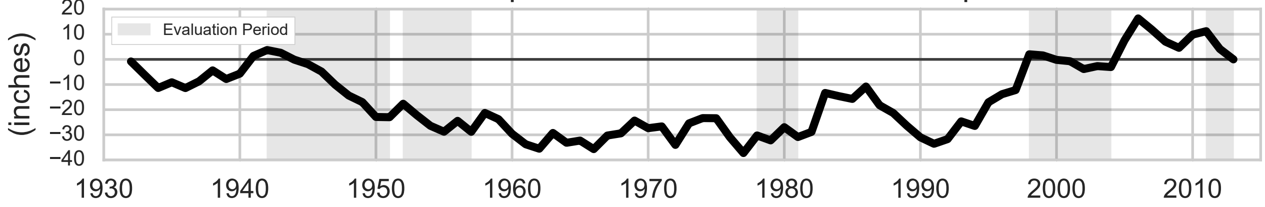

Cumulative Departure from Mean Annual Precipitation

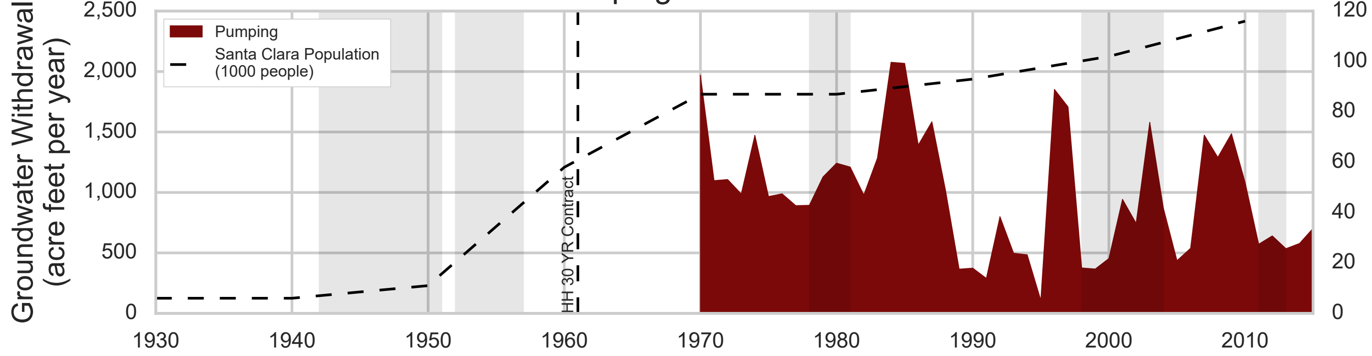

Groundwater Pumping in Santa Clara: GW Area

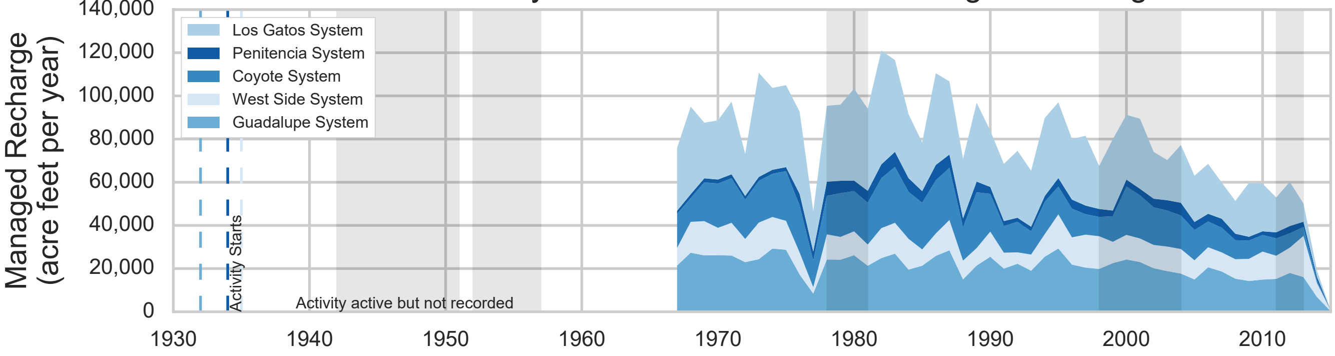

District Activity: Santa Clara Subbasin Managed Recharge

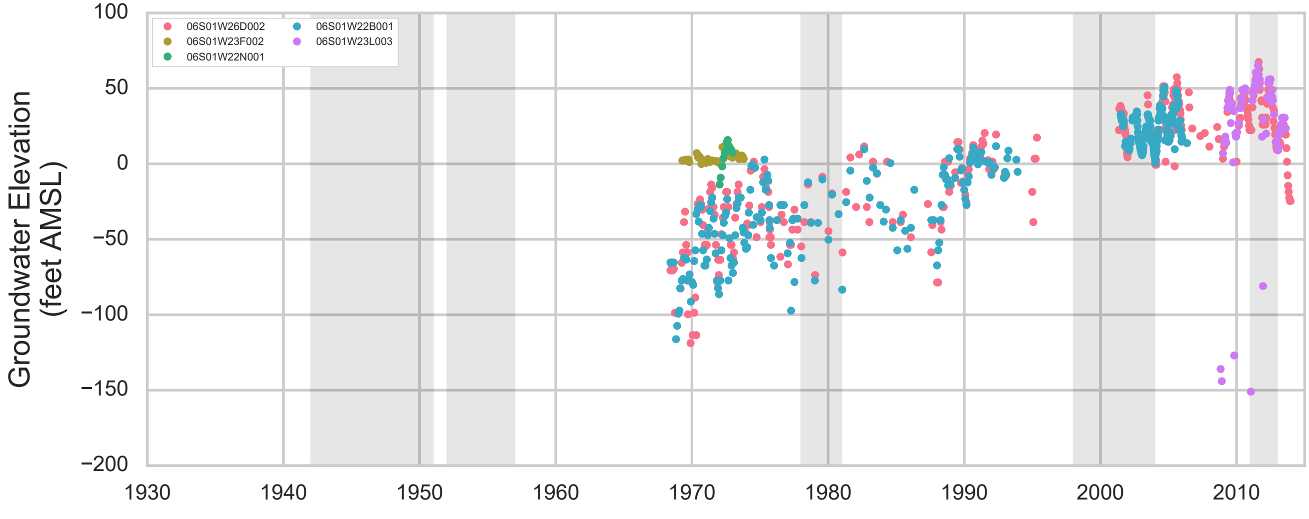

Observed Groundwater Elevations in Santa Clara: GW Area

Pumping Area: Santa Clara: RWS GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

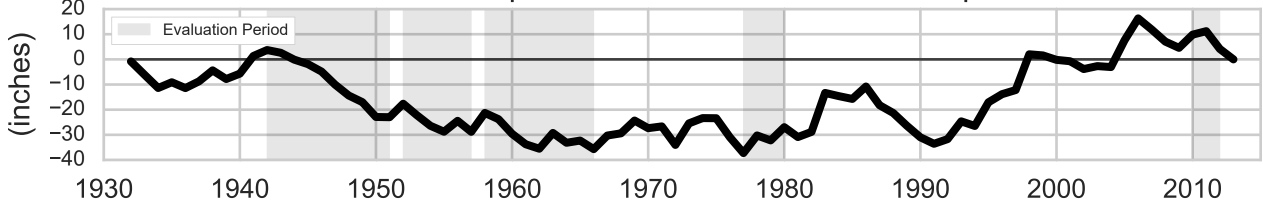

Cumulative Departure from Mean Annual Precipitation

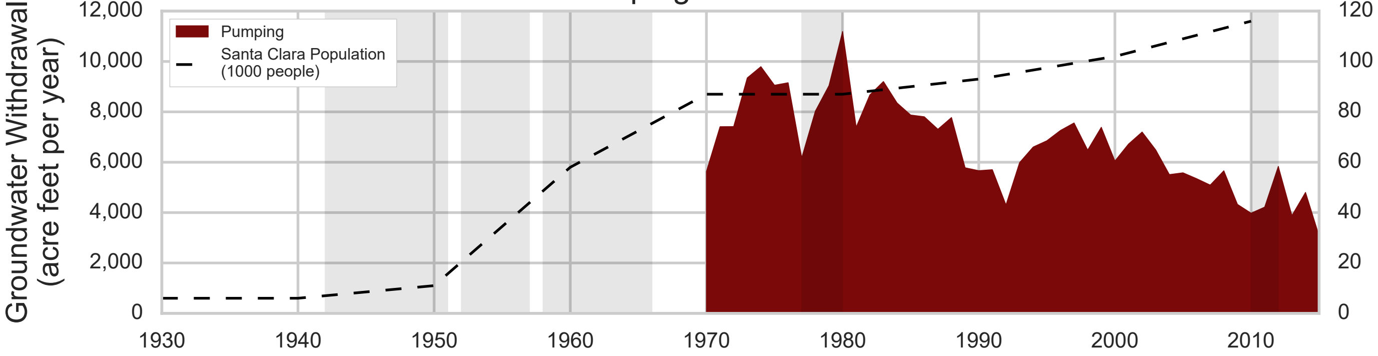

Groundwater Pumping in Santa Clara: RWS GW Area

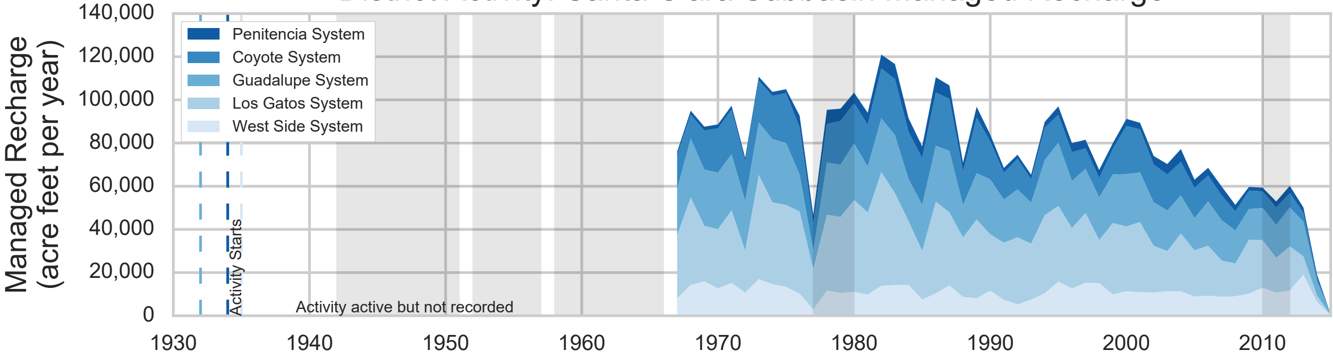

District Activity: Santa Clara Subbasin Managed Recharge

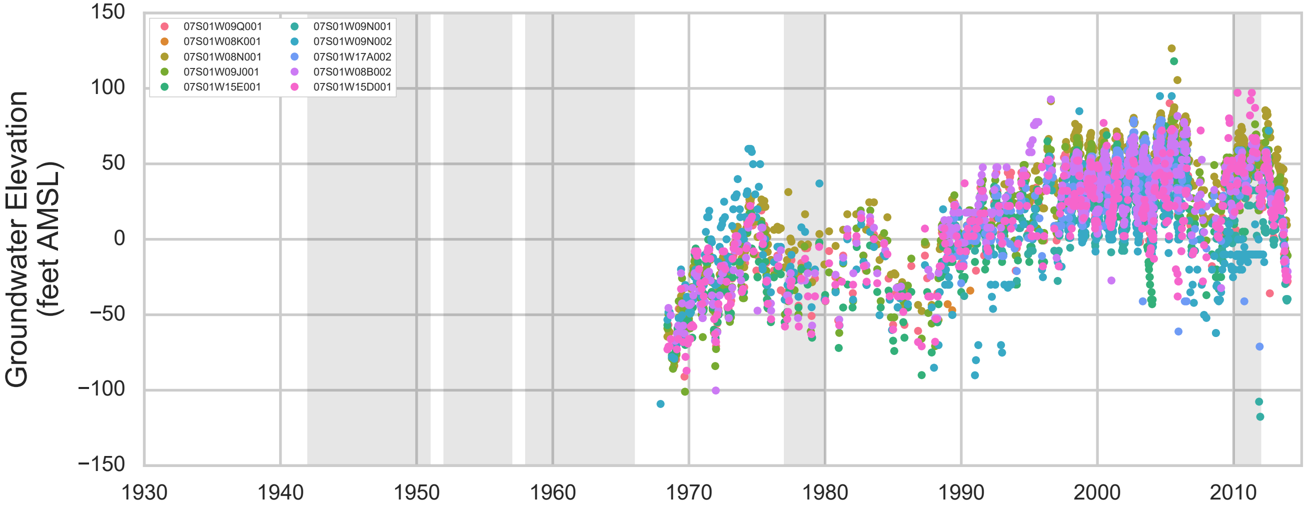

Observed Groundwater Elevations in Santa Clara: RWS GW Area

Pumping Area: Santa Clara: TW GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

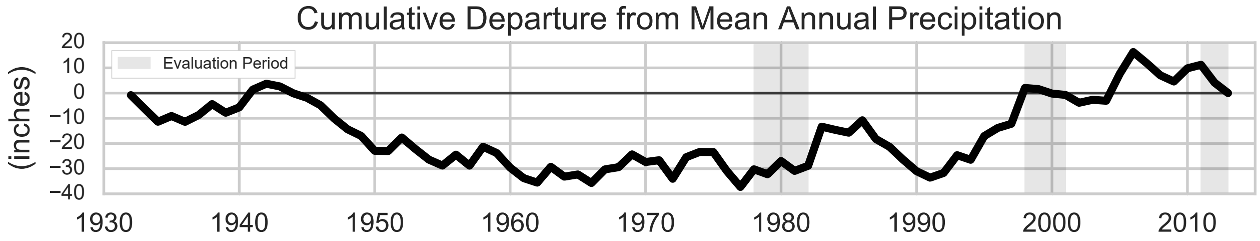

Cumulative Departure from Mean Annual Precipitation

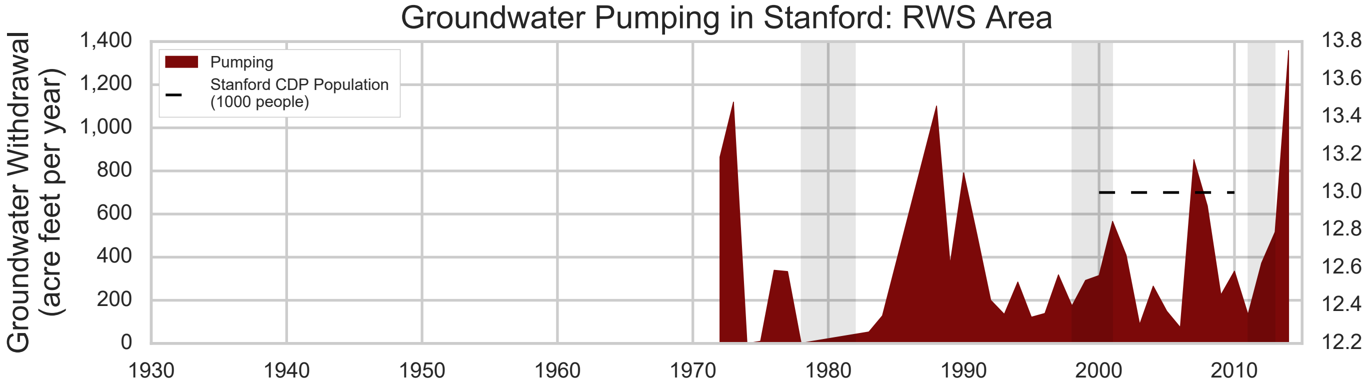

Groundwater Pumping in Santa Clara: TW GW Area

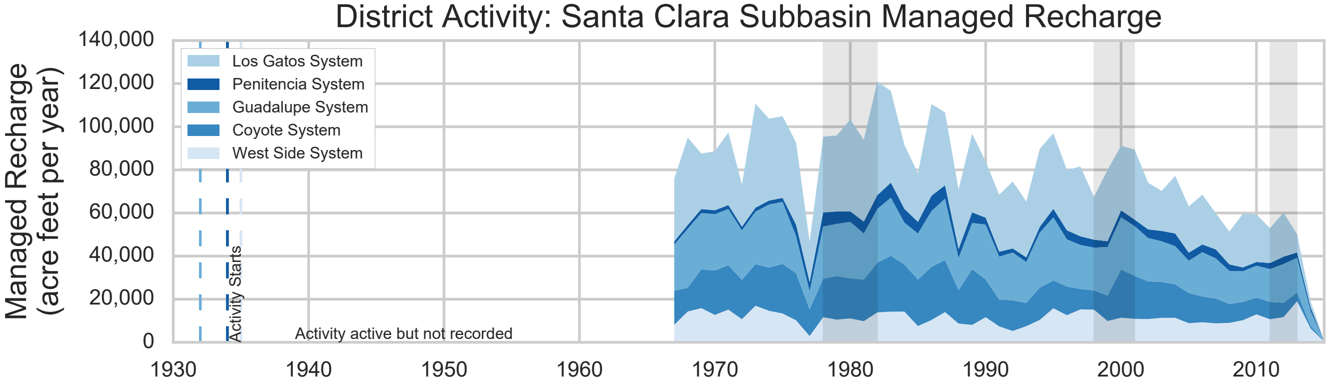

District Activity: Santa Clara Subbasin Managed Recharge

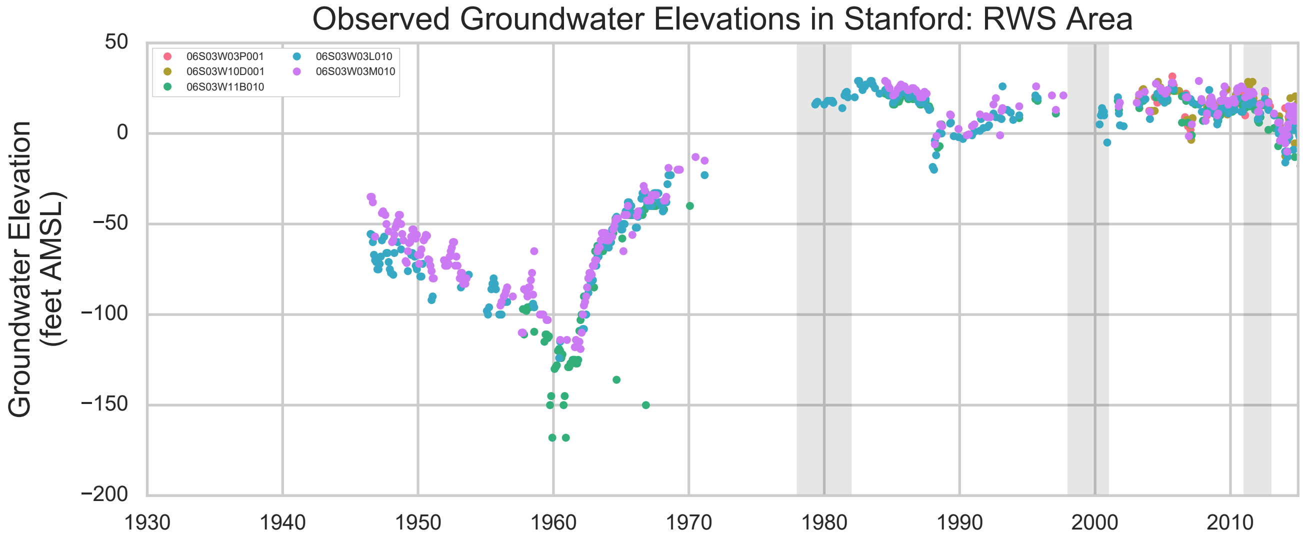

Observed Groundwater Elevations in Santa Clara: TW GW Area

Pumping Area: Stanford: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells


Cumulative Departure from Mean Annual Precipitation

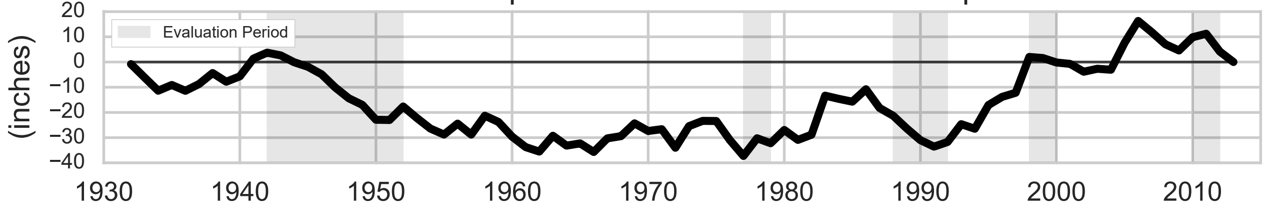

Groundwater Pumping in Stanford: RWS Area


District Activity: Santa Clara Subbasin Managed Recharge

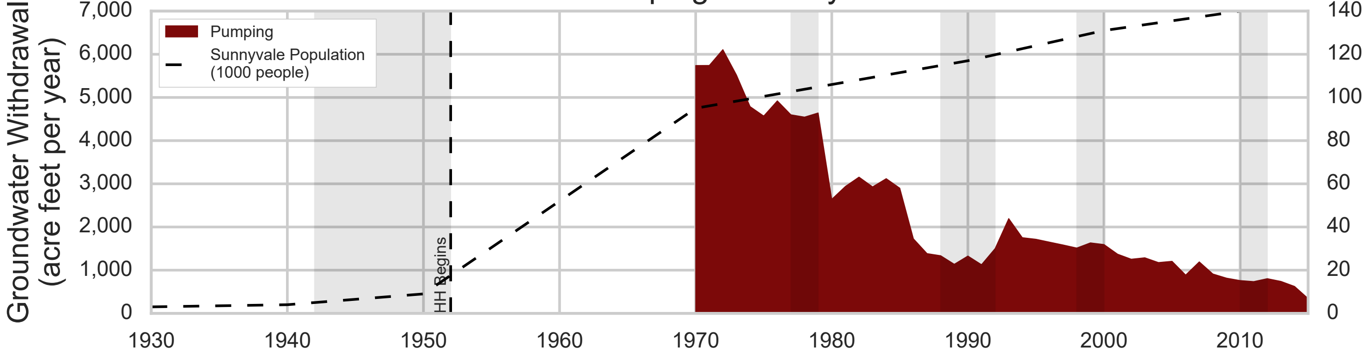

Observed Groundwater Elevations in Stanford: RWS Area

Pumping Area: Sunnyvale: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

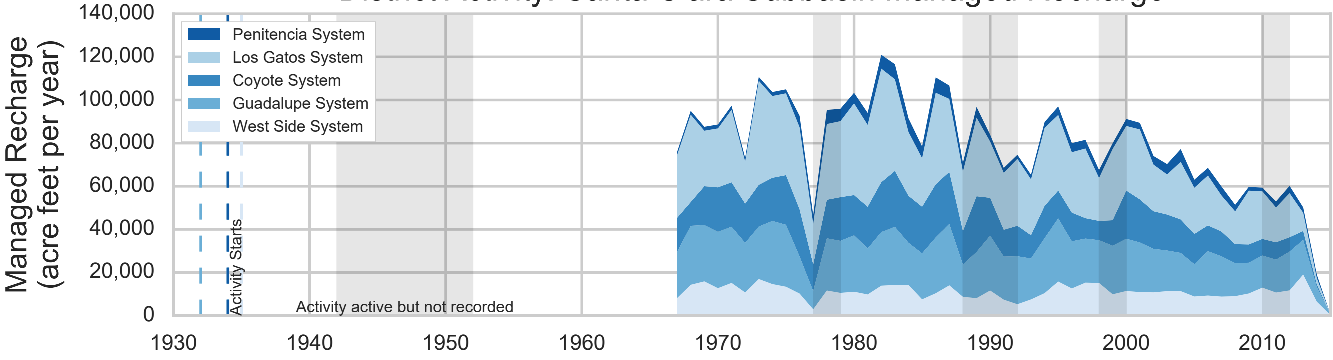
Cumulative Departure from Mean Annual Precipitation



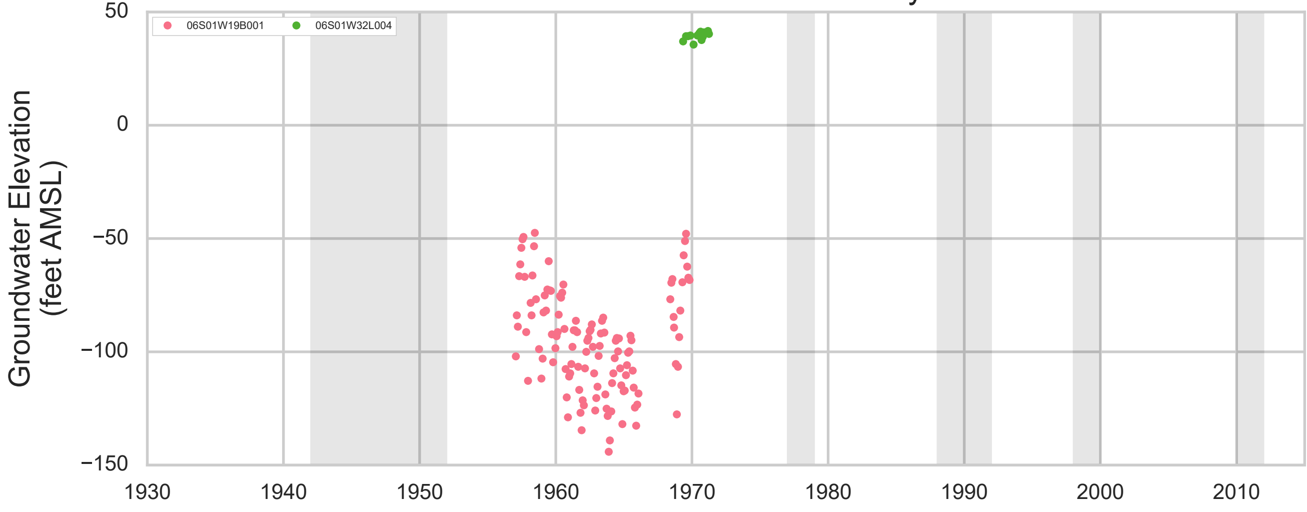
Groundwater Pumping in Sunnyvale: RWS Area



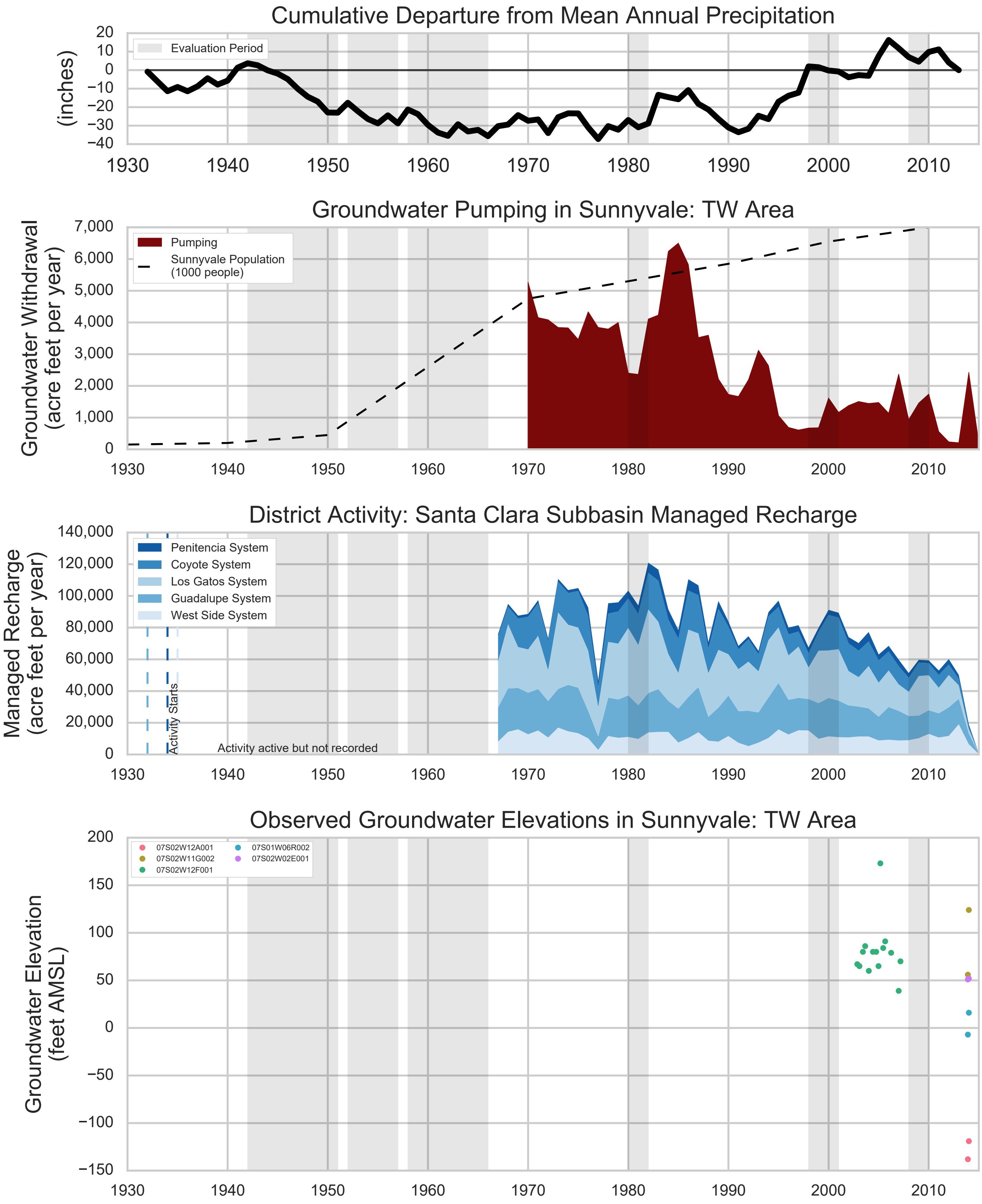
District Activity: Santa Clara Subbasin Managed Recharge



Observed Groundwater Elevations in Sunnyvale: RWS Area



Pumping Area: Sunnyvale: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells



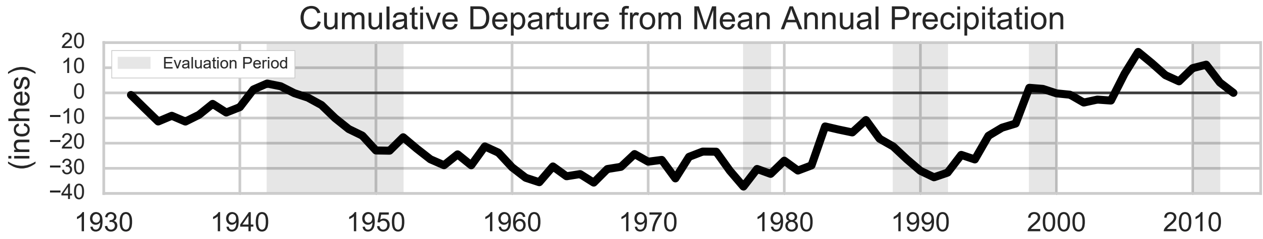
Cumulative Departure from Mean Annual Precipitation

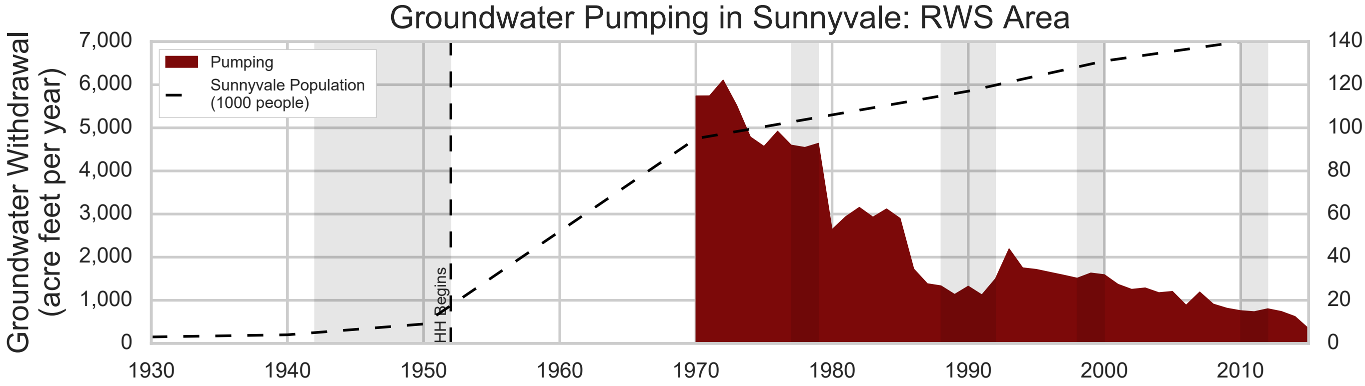
Groundwater Pumping in Sunnyvale: TW Area

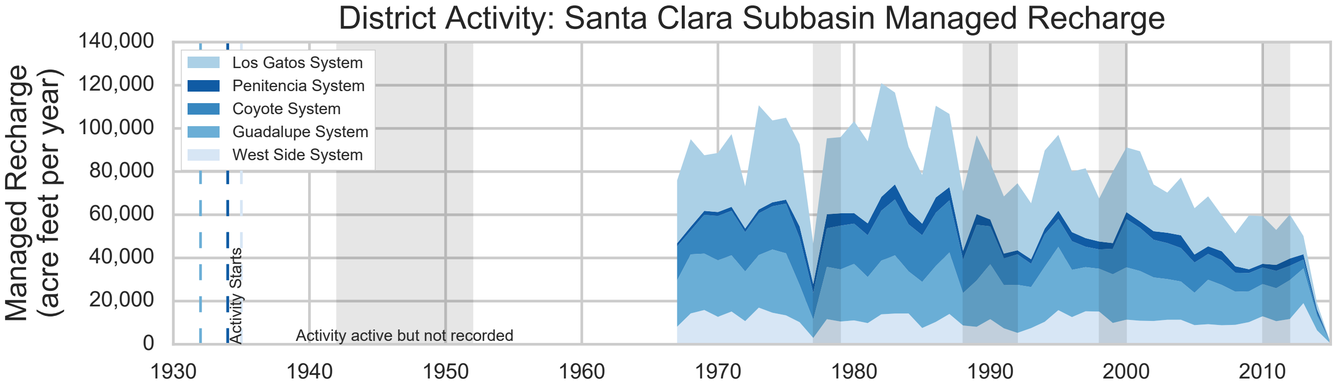
District Activity: Santa Clara Subbasin Managed Recharge

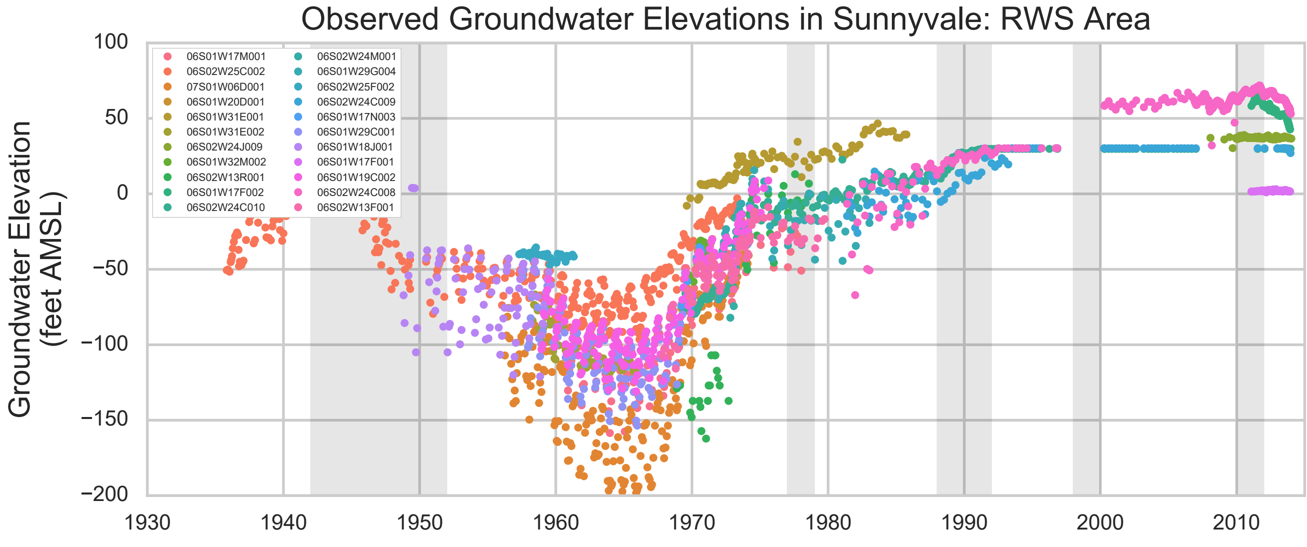
Observed Groundwater Elevations in Sunnyvale: TW Area

Pumping Area: Sunnyvale: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

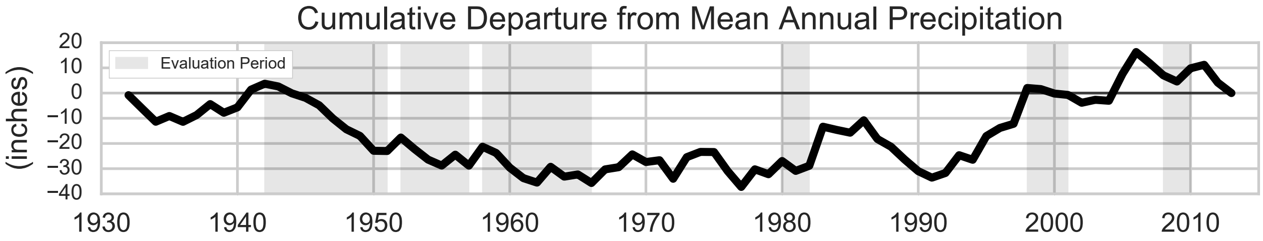

Cumulative Departure from Mean Annual Precipitation


Groundwater Pumping in Sunnyvale: RWS Area

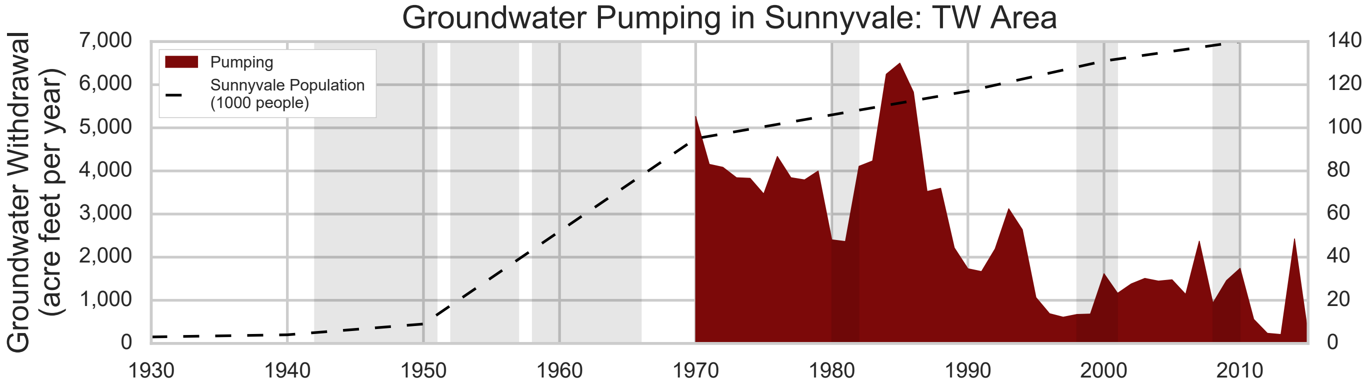

District Activity: Santa Clara Subbasin Managed Recharge


Observed Groundwater Elevations in Sunnyvale: RWS Area

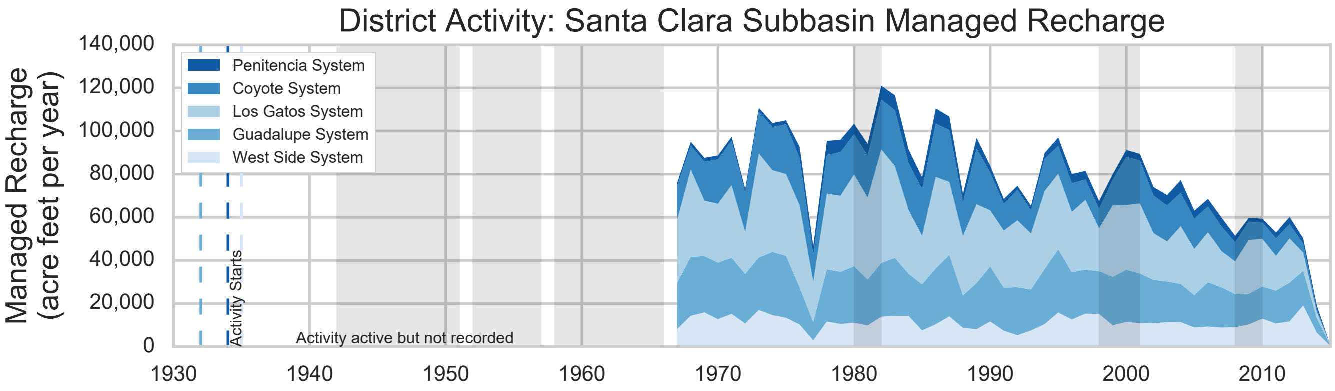
Pumping Area: Sunnyvale: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells



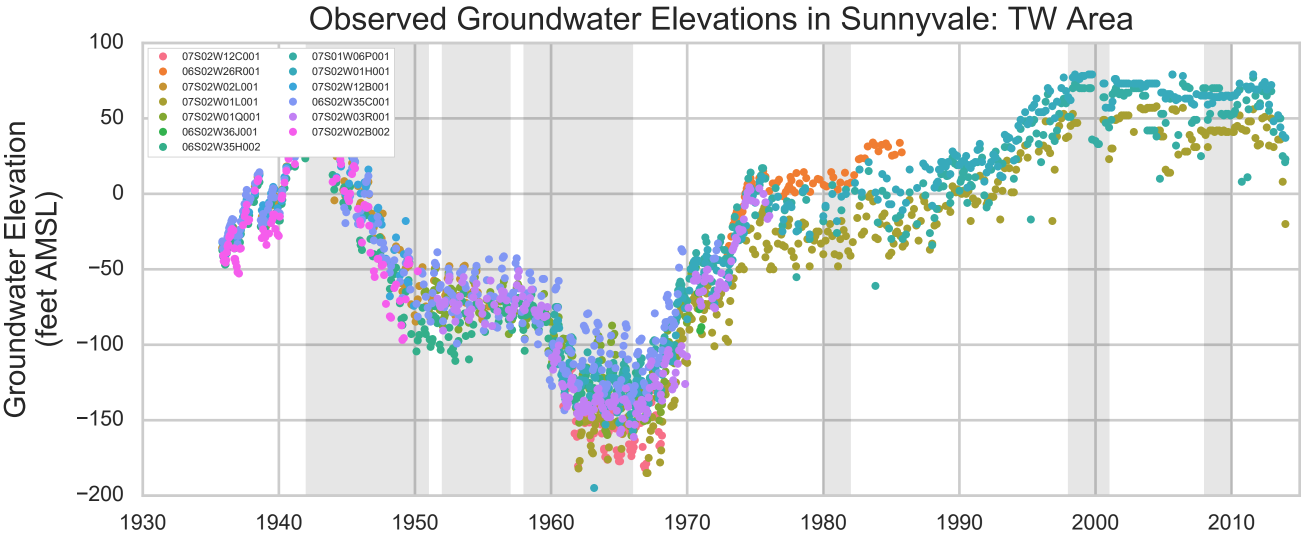
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Sunnyvale: TW Area



District Activity: Santa Clara Subbasin Managed Recharge



Observed Groundwater Elevations in Sunnyvale: TW Area

MONTGOMERY
& ASSOCIATES

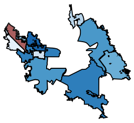
Appendix D

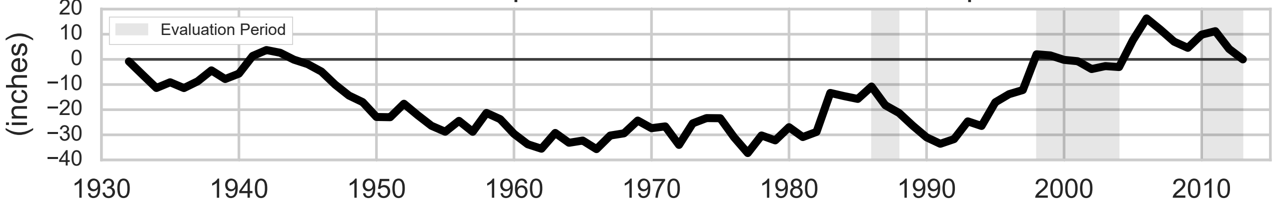
Groundwater Level Trends in Monitoring Wells to Evaluate Benefits from Treated Water Deliveries

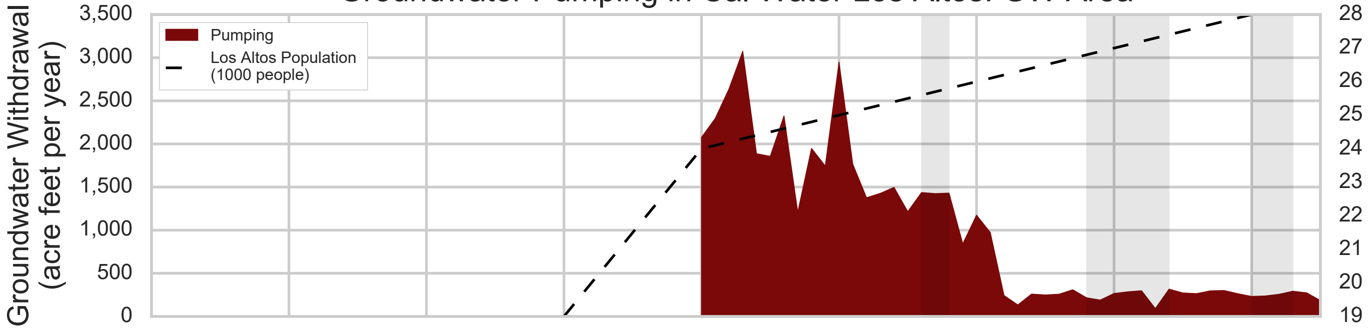
Pumping Area: Cal Water Los Altos: GW

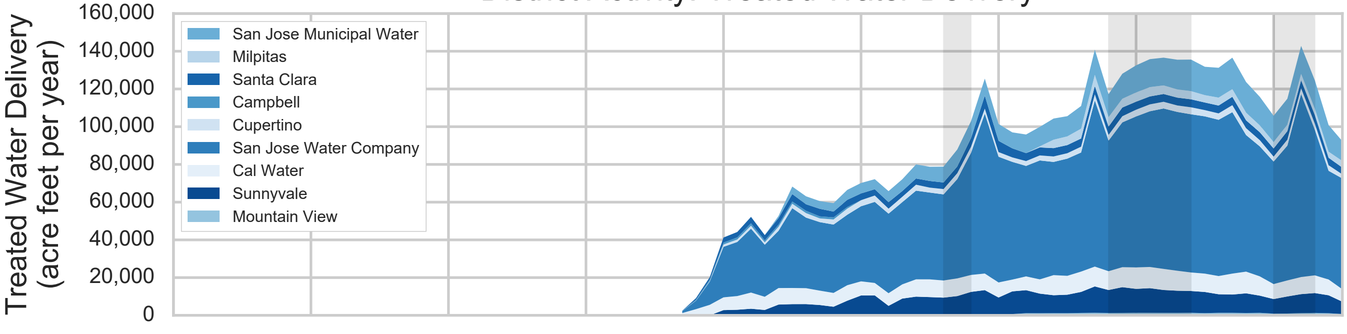
Activity: Treated Water Delivery

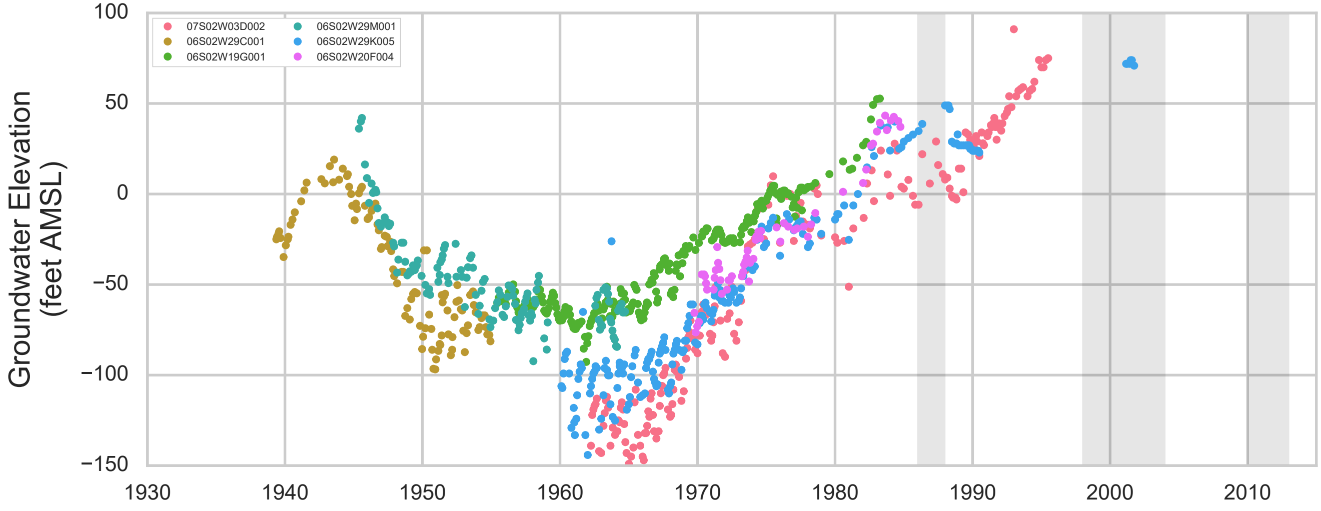
Groundwater Level Data from: Monitoring Wells



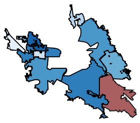

Cumulative Departure from Mean Annual Precipitation


Groundwater Pumping in Cal Water Los Altos: GW Area

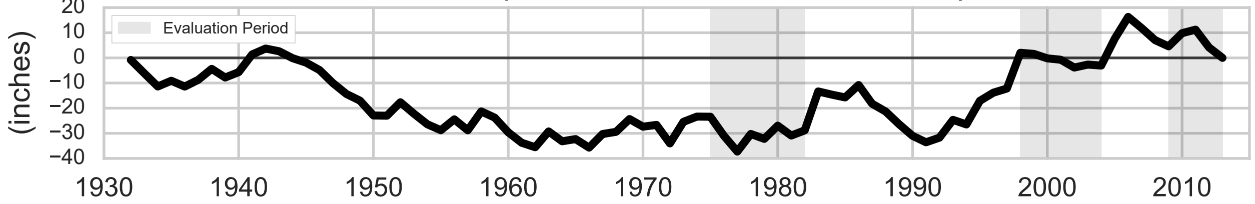

District Activity: Treated Water Delivery


Observed Groundwater Elevations in Cal Water Los Altos: GW Area

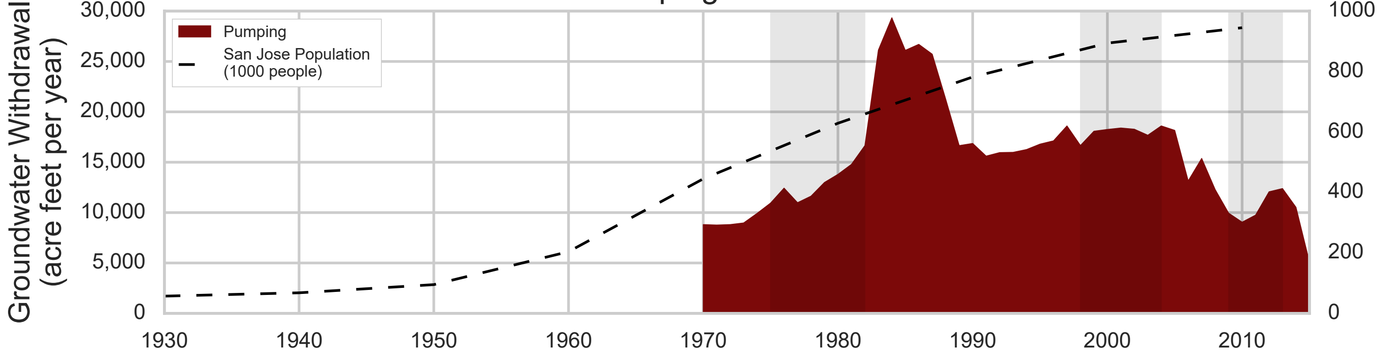
Pumping Area: Great Oaks: GW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



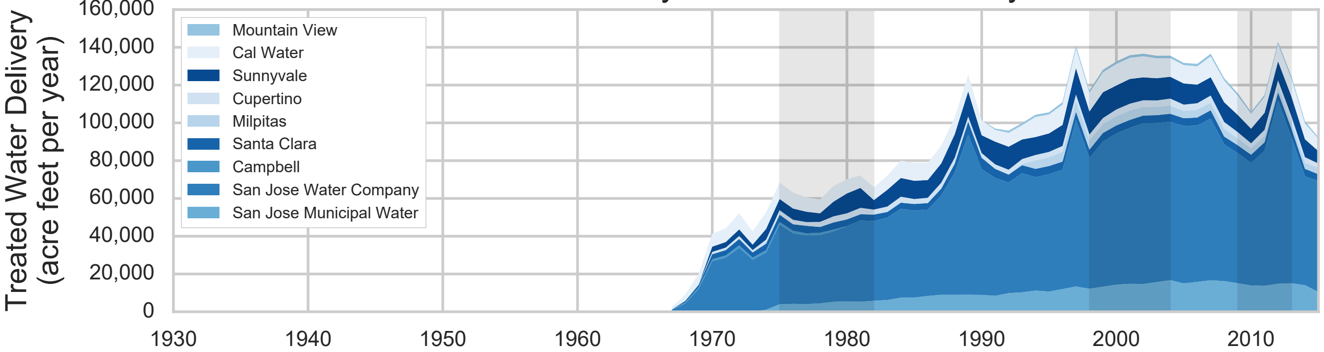
Cumulative Departure from Mean Annual Precipitation



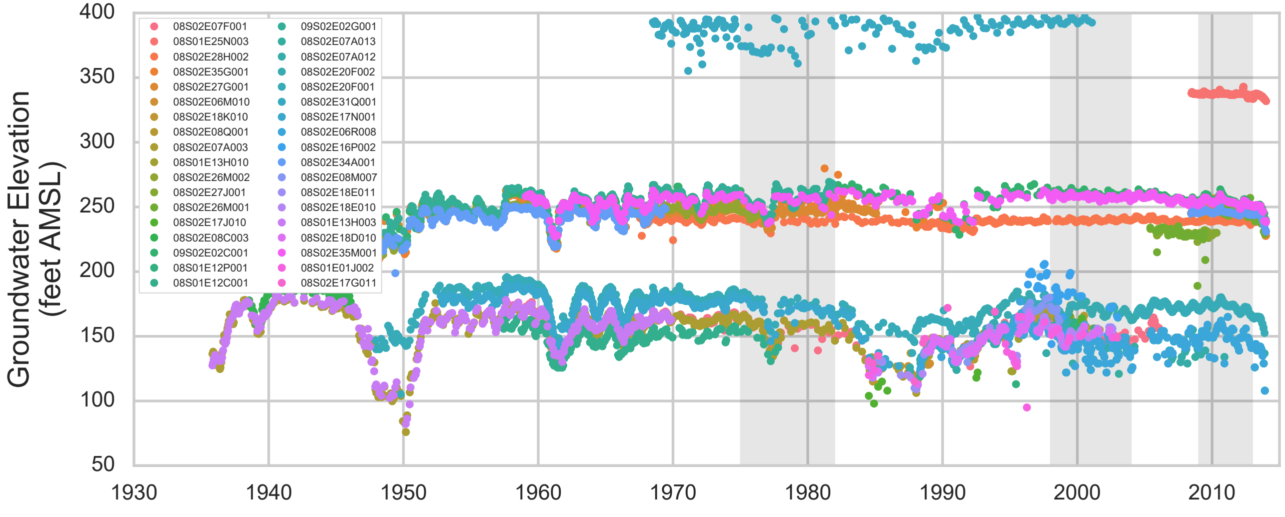
Groundwater Pumping in Great Oaks: GW Area



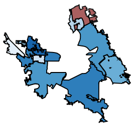
District Activity: Treated Water Delivery

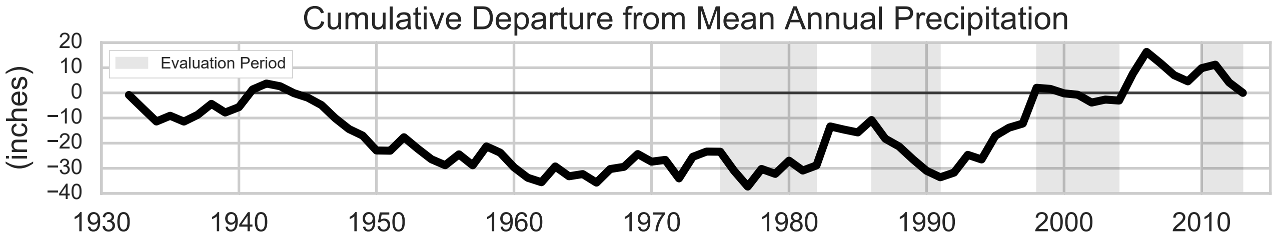


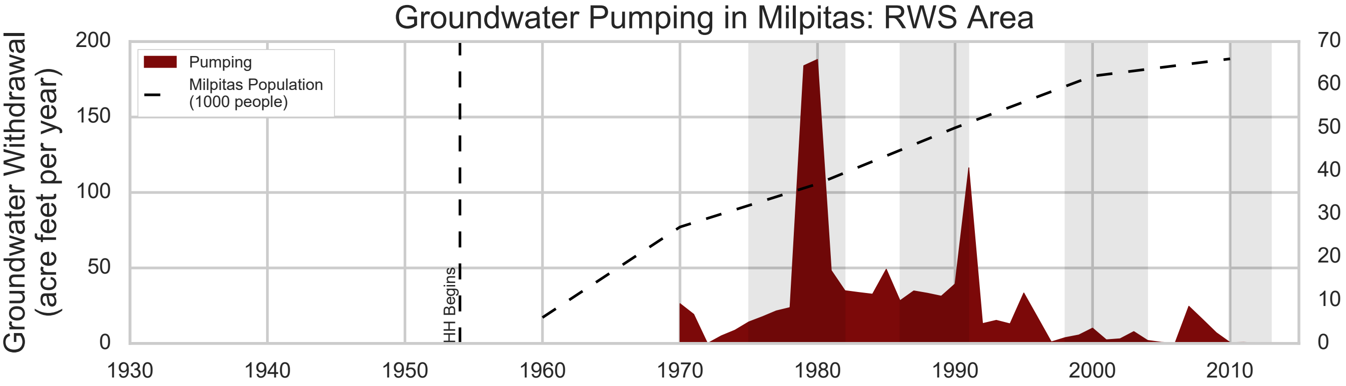
Observed Groundwater Elevations in Great Oaks: GW Area

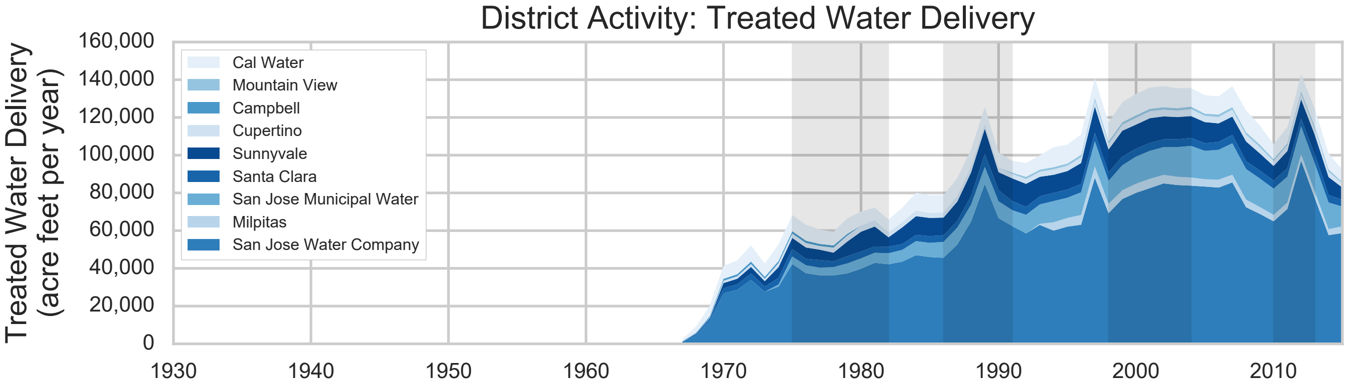


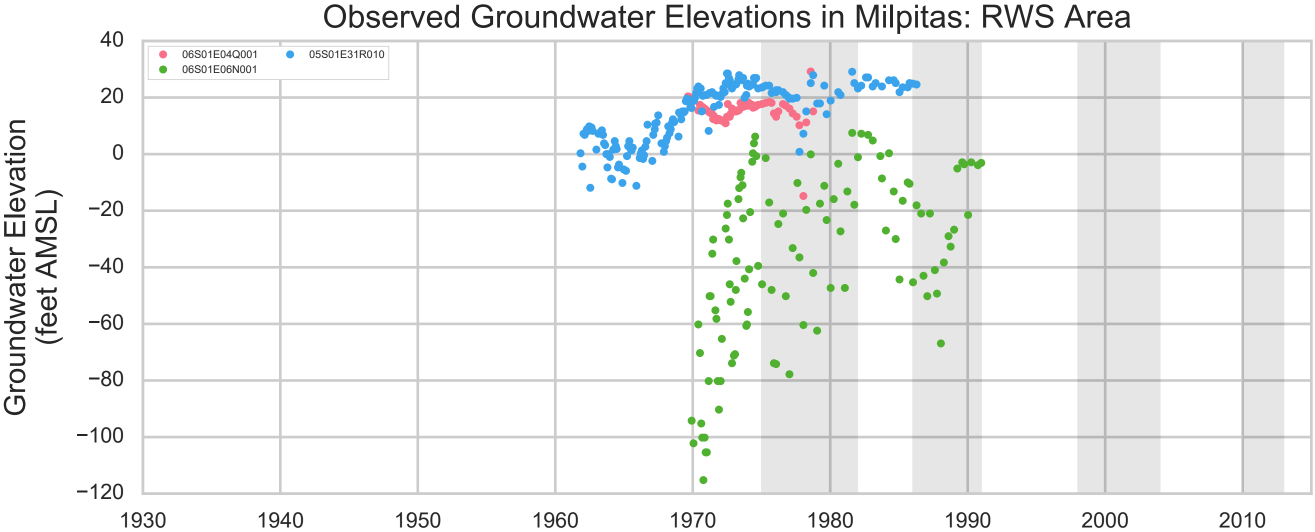
Pumping Area: Milpitas: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



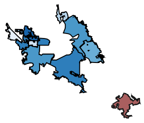

Cumulative Departure from Mean Annual Precipitation

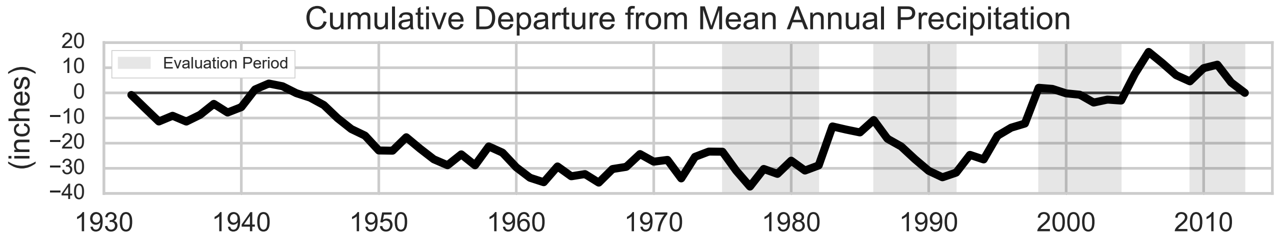

Groundwater Pumping in Milpitas: RWS Area

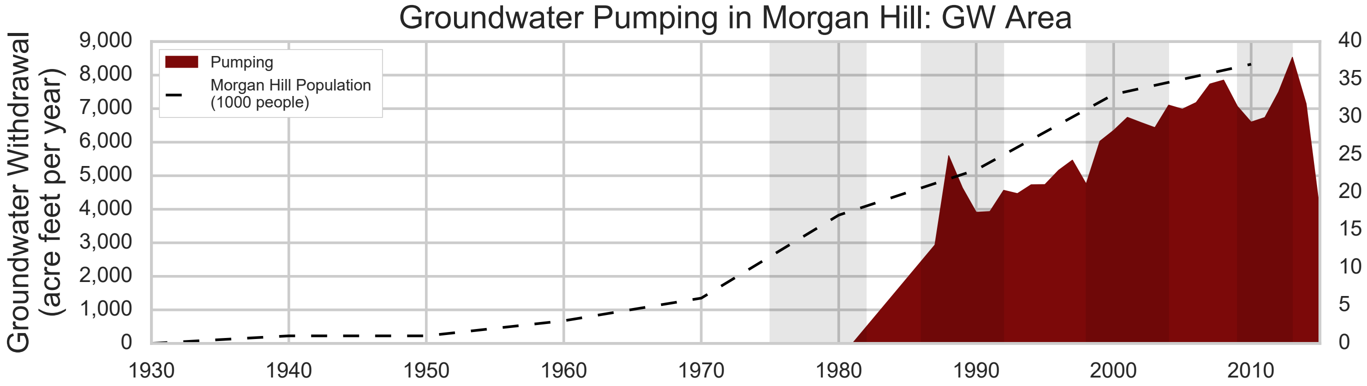

District Activity: Treated Water Delivery

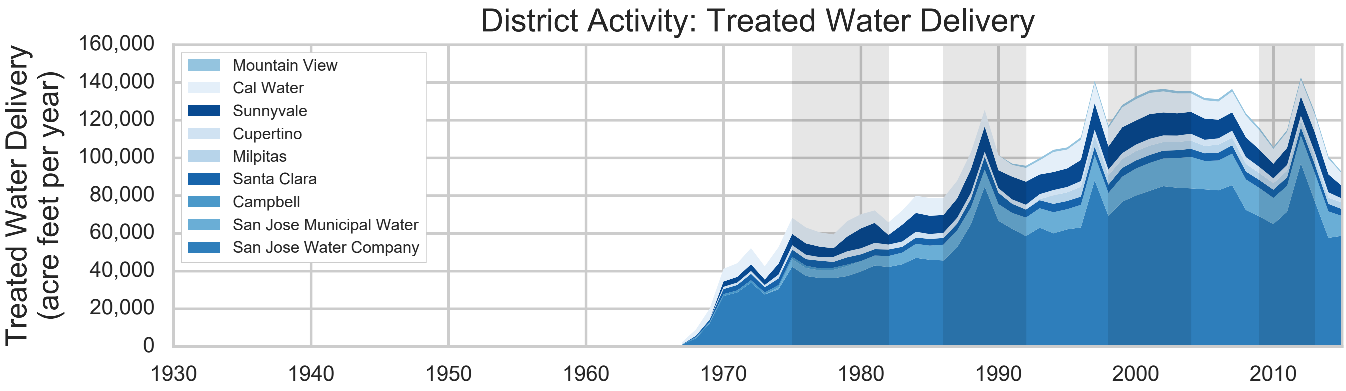

Observed Groundwater Elevations in Milpitas: RWS Area

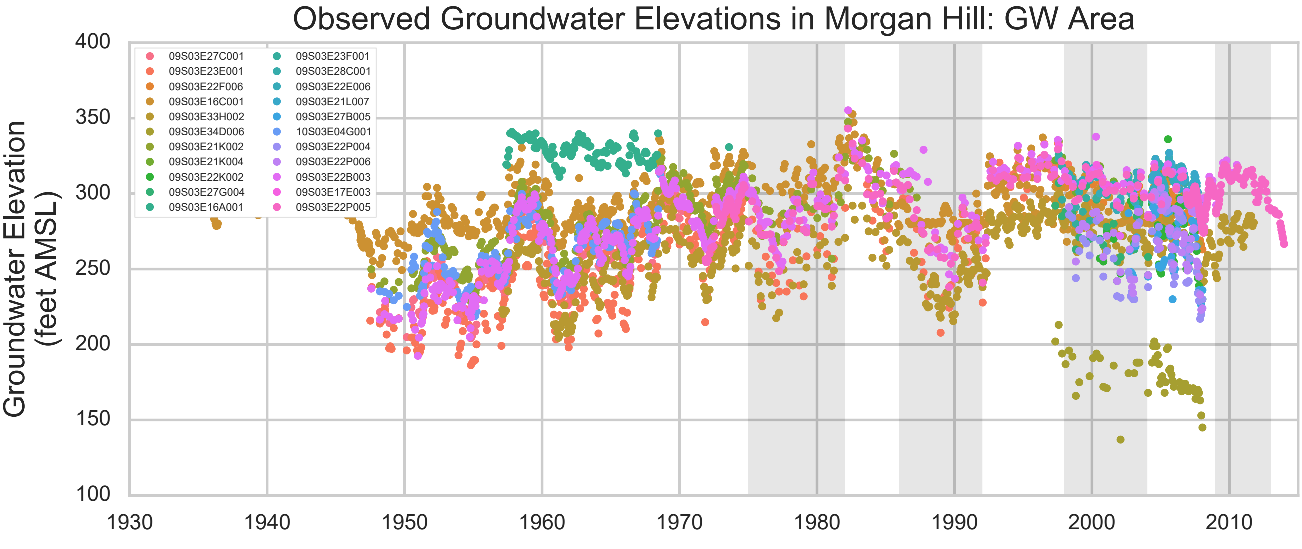
Pumping Area: Morgan Hill: GW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



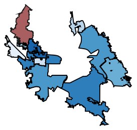

Cumulative Departure from Mean Annual Precipitation

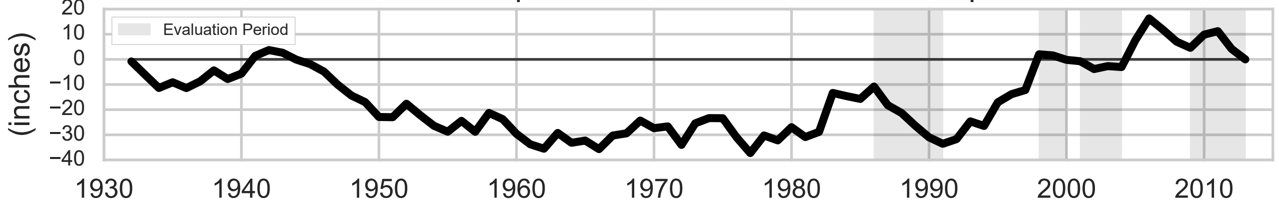

Groundwater Pumping in Morgan Hill: GW Area

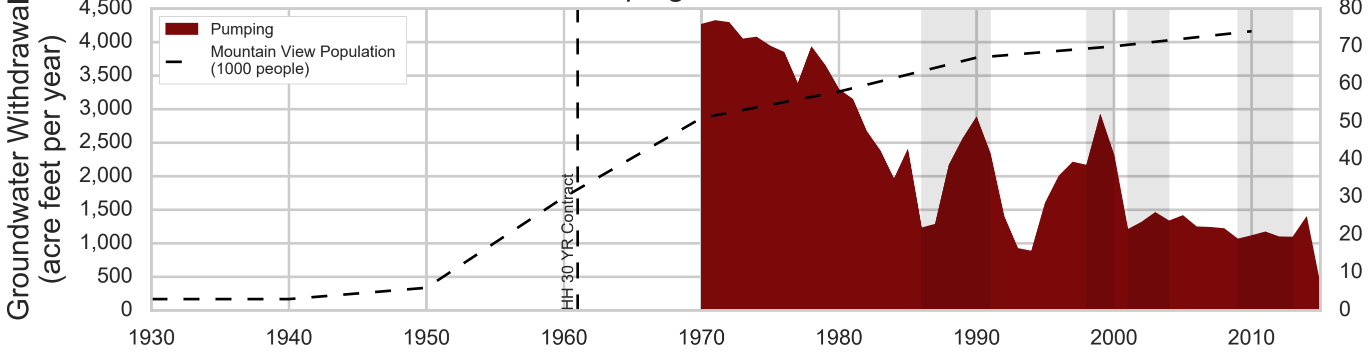

District Activity: Treated Water Delivery

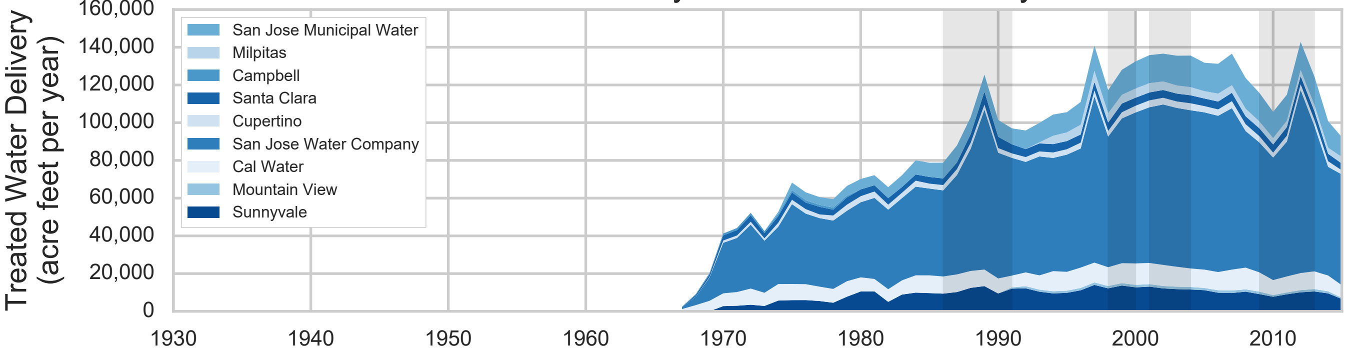

Observed Groundwater Elevations in Morgan Hill: GW Area

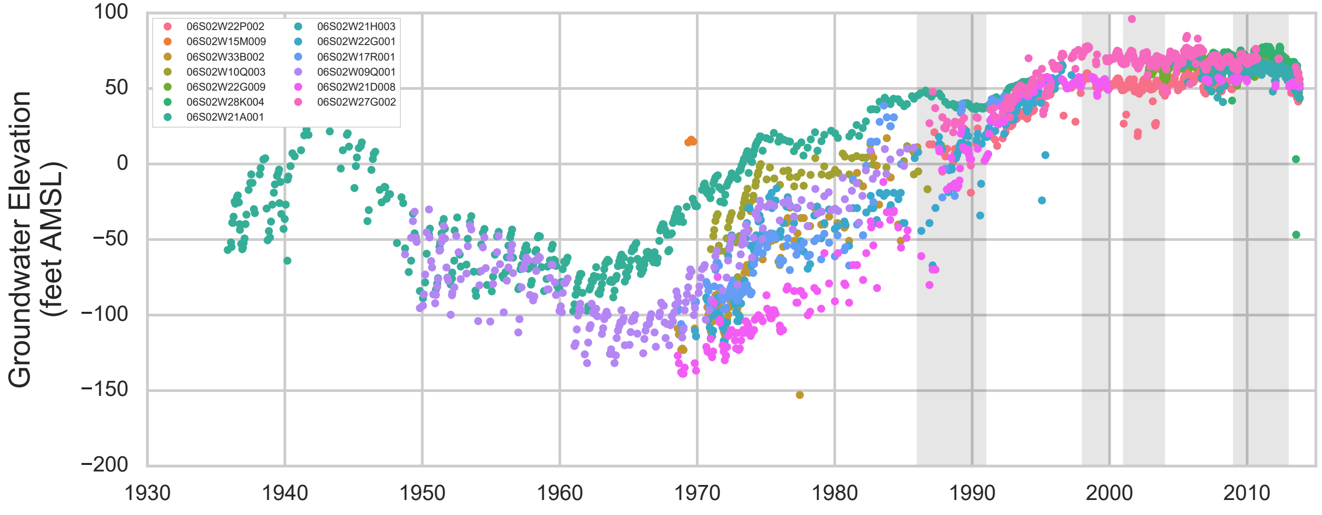
Pumping Area: Mountain View: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



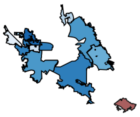

Cumulative Departure from Mean Annual Precipitation

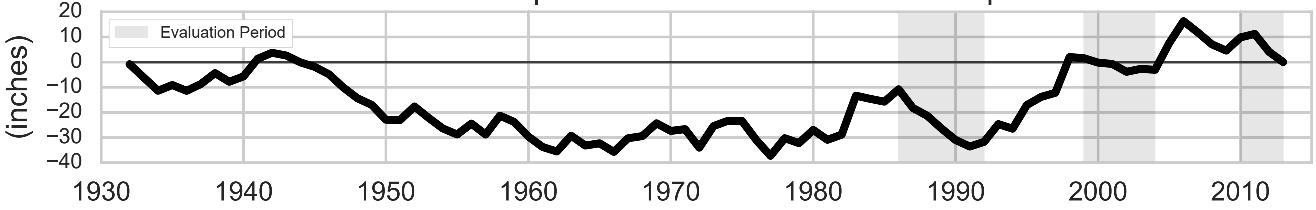

Groundwater Pumping in Mountain View: RWS Area


District Activity: Treated Water Delivery

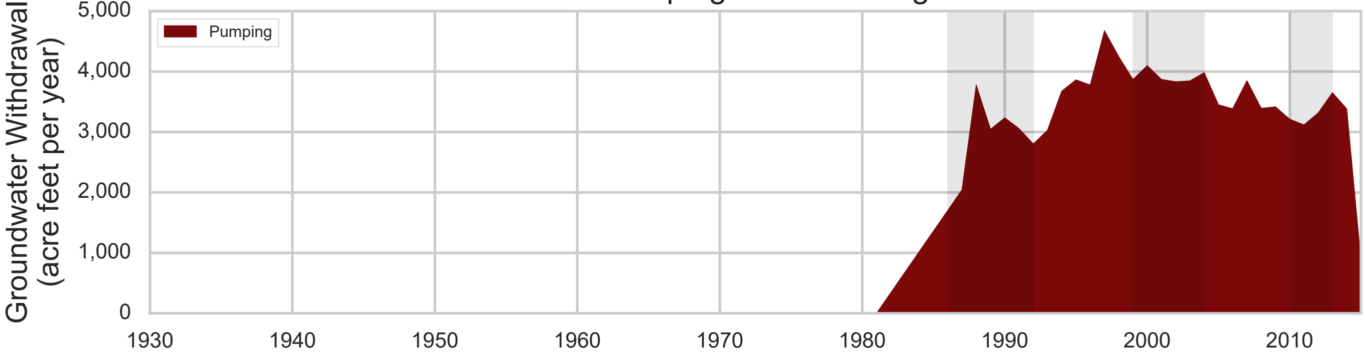

Observed Groundwater Elevations in Mountain View: RWS Area

Pumping Area: North Morgan Hill:
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells

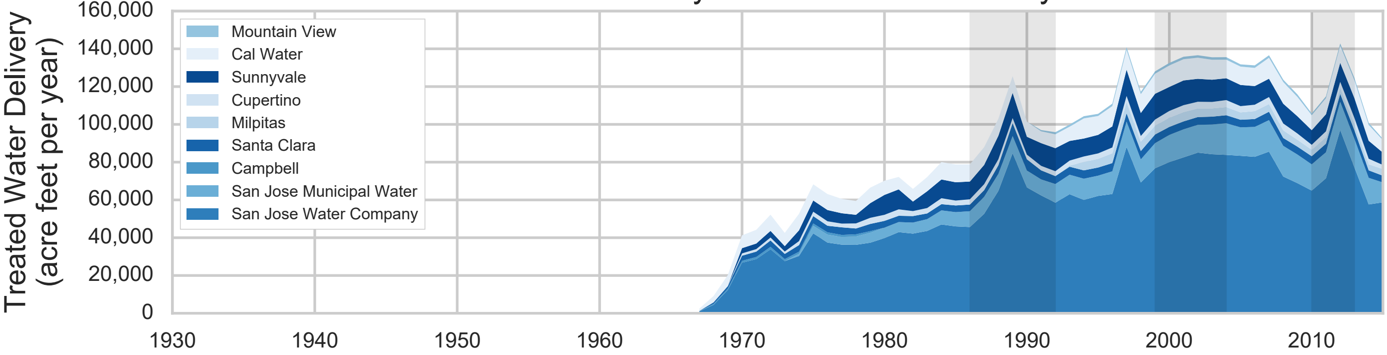




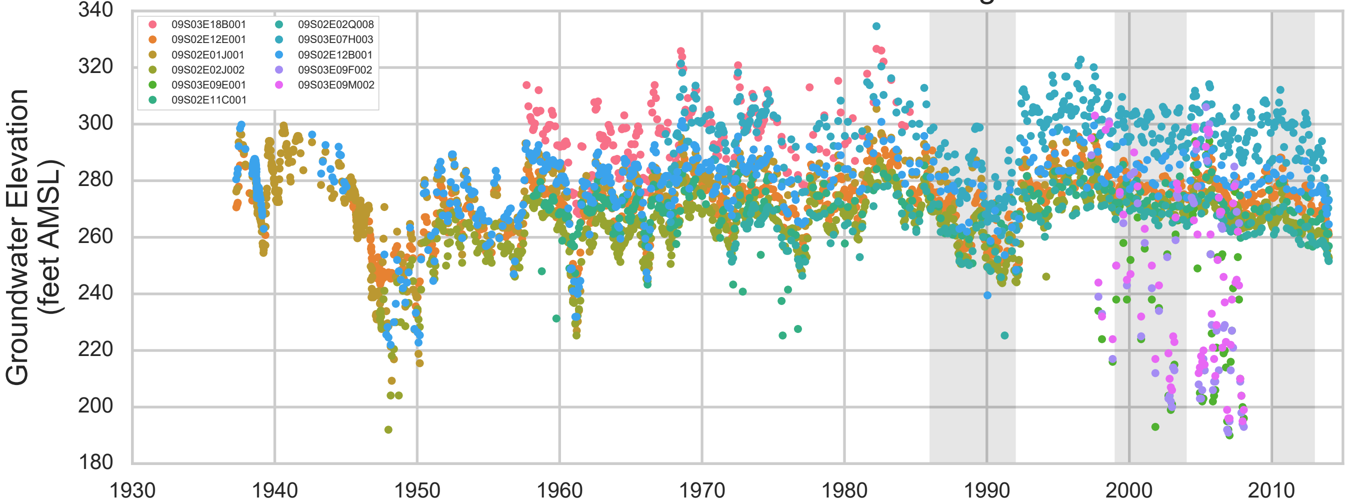
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in North Morgan Hill: Area

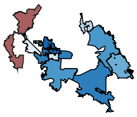


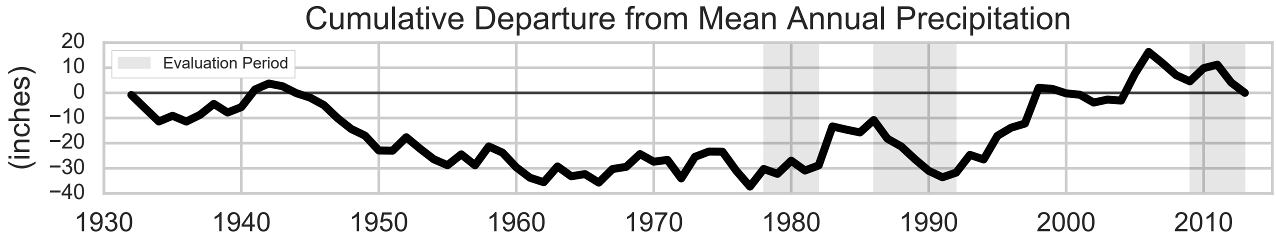
District Activity: Treated Water Delivery

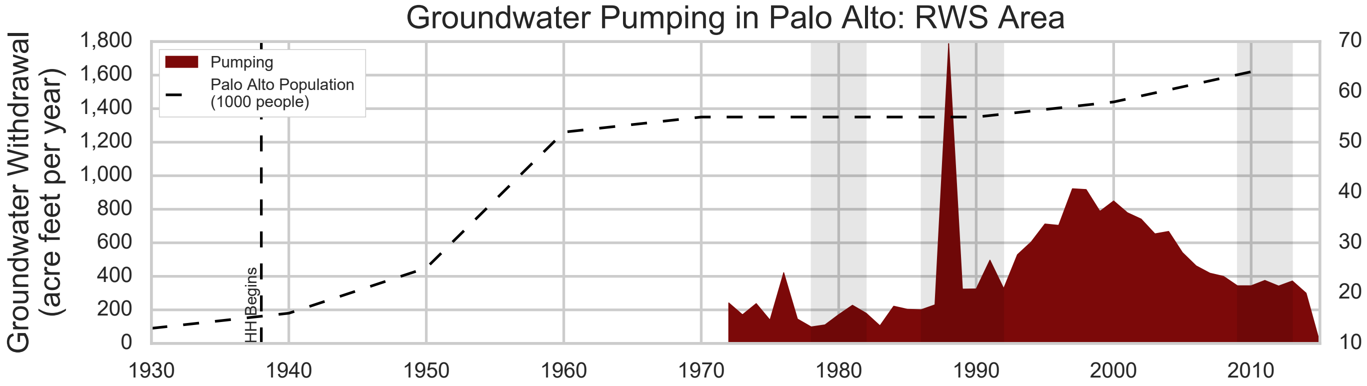


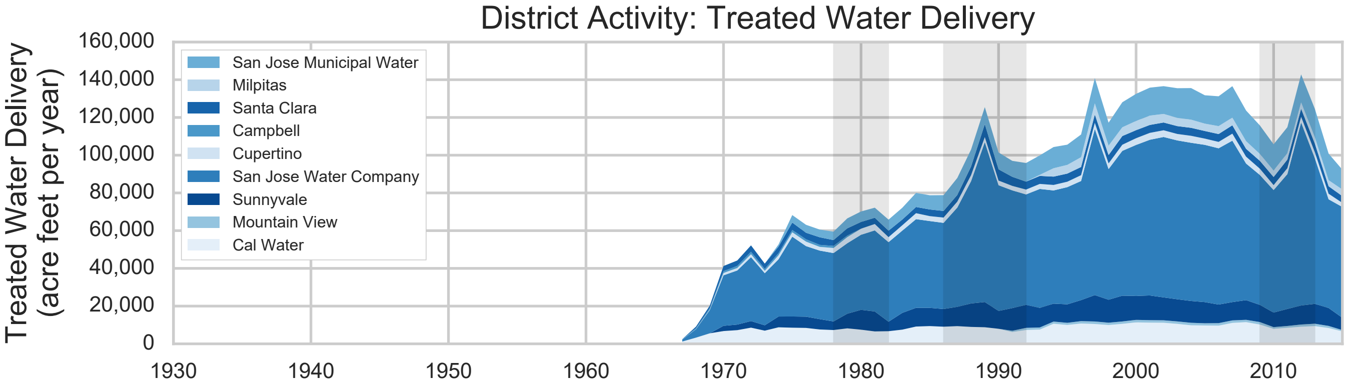
Observed Groundwater Elevations in North Morgan Hill: Area

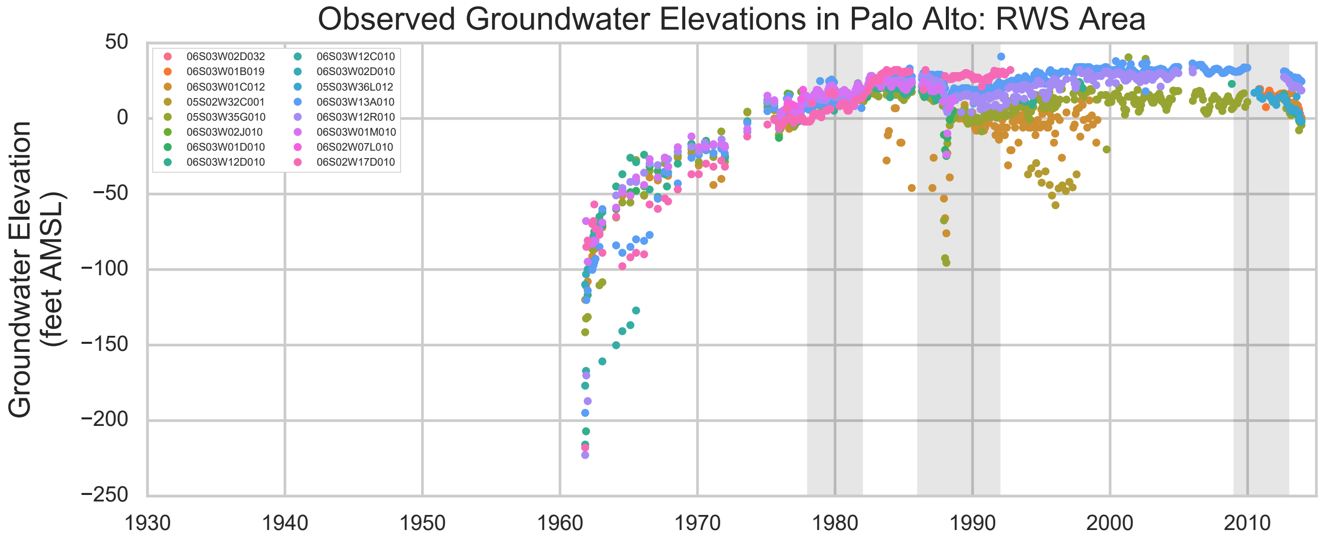
Pumping Area: Palo Alto: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



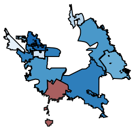

Cumulative Departure from Mean Annual Precipitation


Groundwater Pumping in Palo Alto: RWS Area

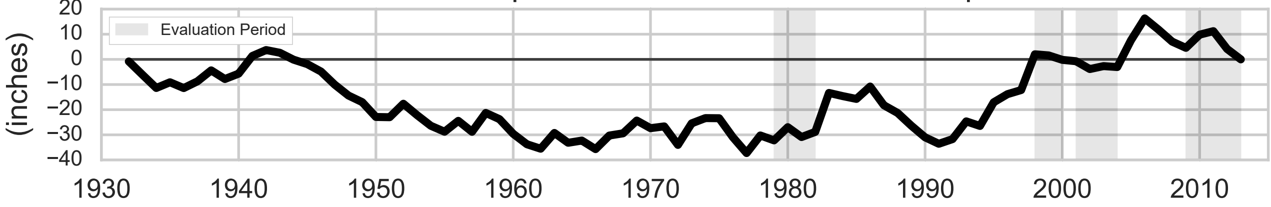

District Activity: Treated Water Delivery


Observed Groundwater Elevations in Palo Alto: RWS Area

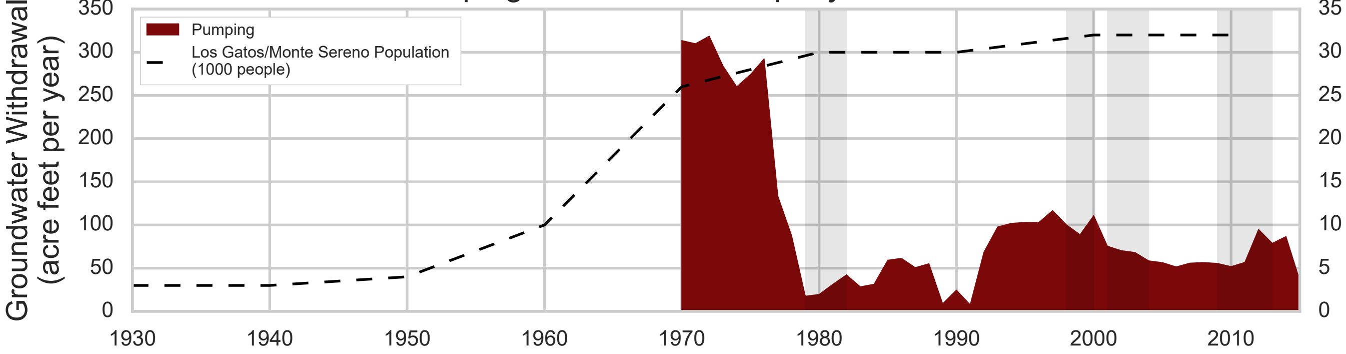
Pumping Area: SJ Water Company Los Gatos: Local SW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



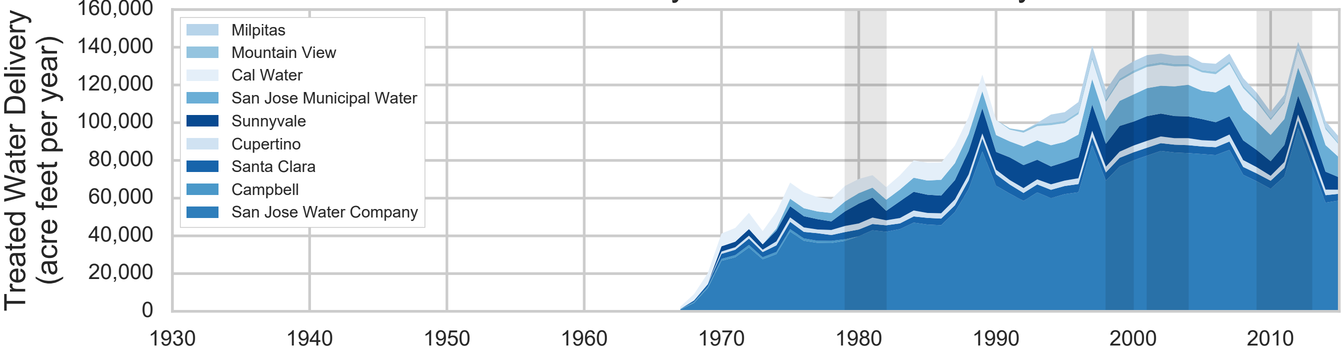
Cumulative Departure from Mean Annual Precipitation



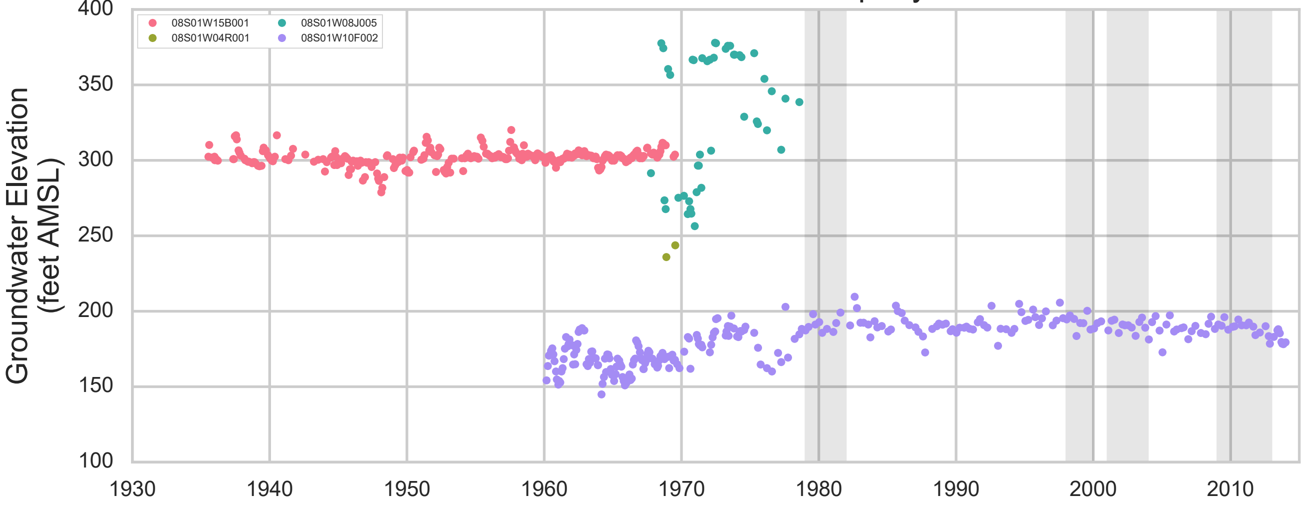
Groundwater Pumping in SJ Water Company Los Gatos: Local SW Area



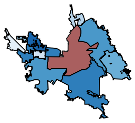
District Activity: Treated Water Delivery

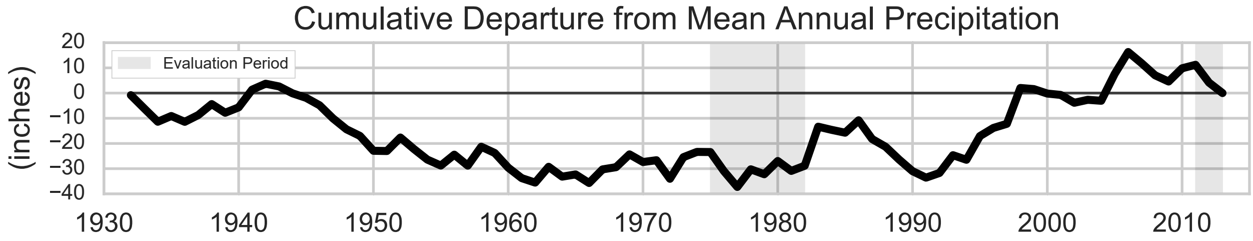


Observed Groundwater Elevations in SJ Water Company Los Gatos: Local SW Area

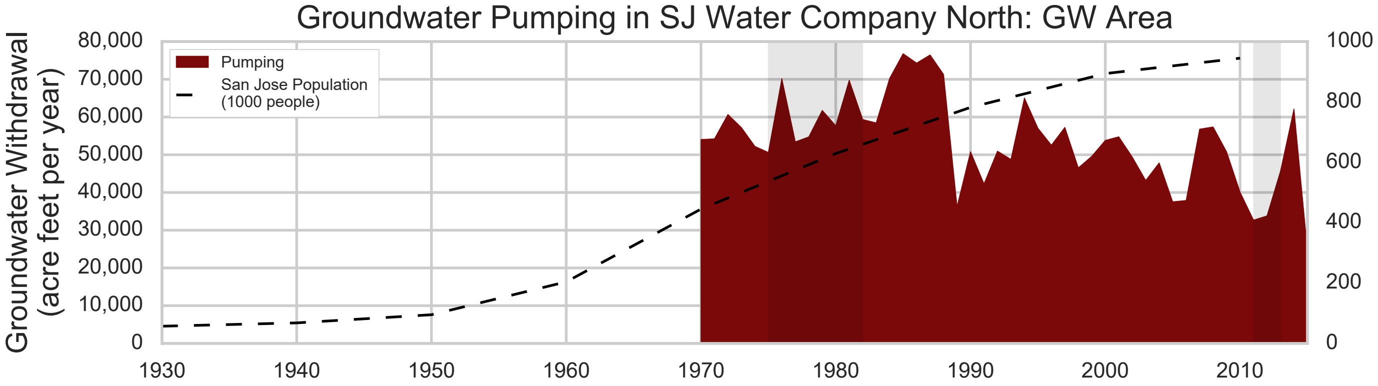


Pumping Area: SJ Water Company North: GW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells

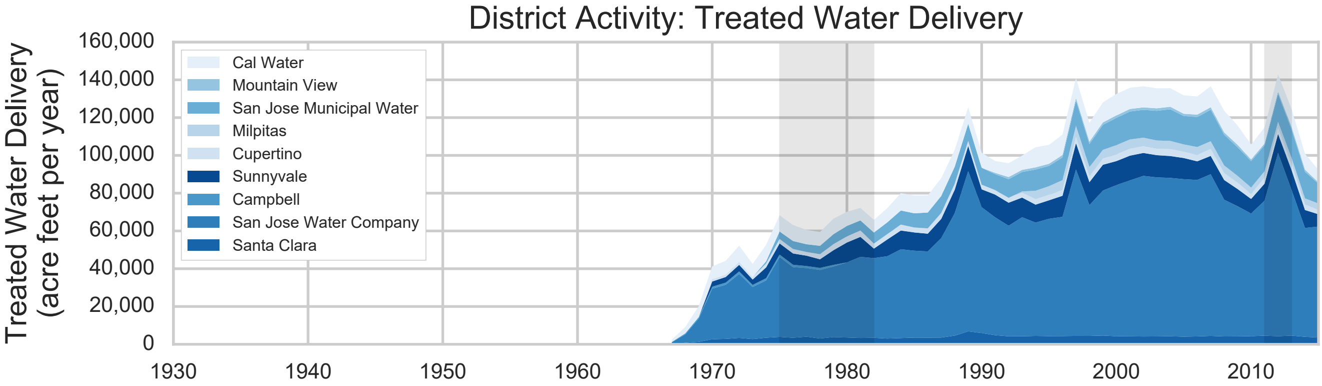




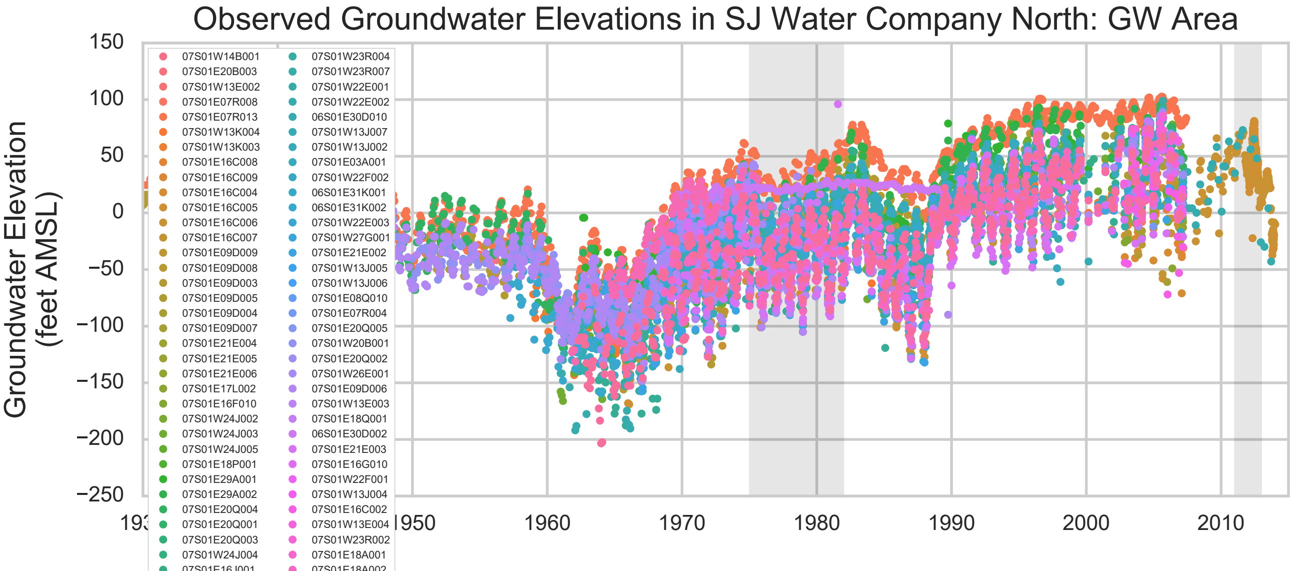
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in SJ Water Company North: GW Area

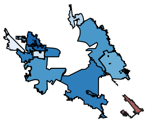


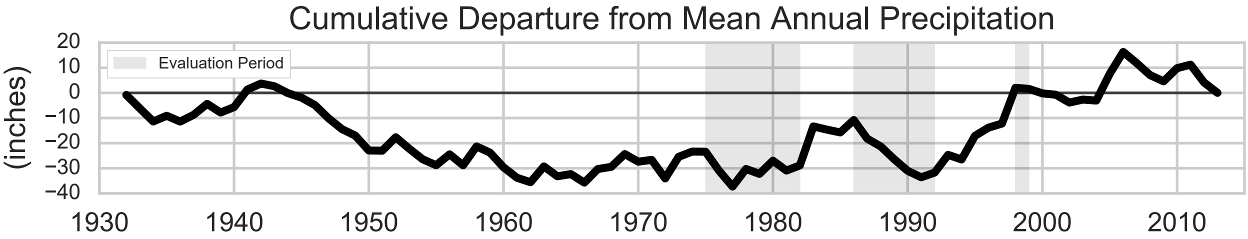
District Activity: Treated Water Delivery

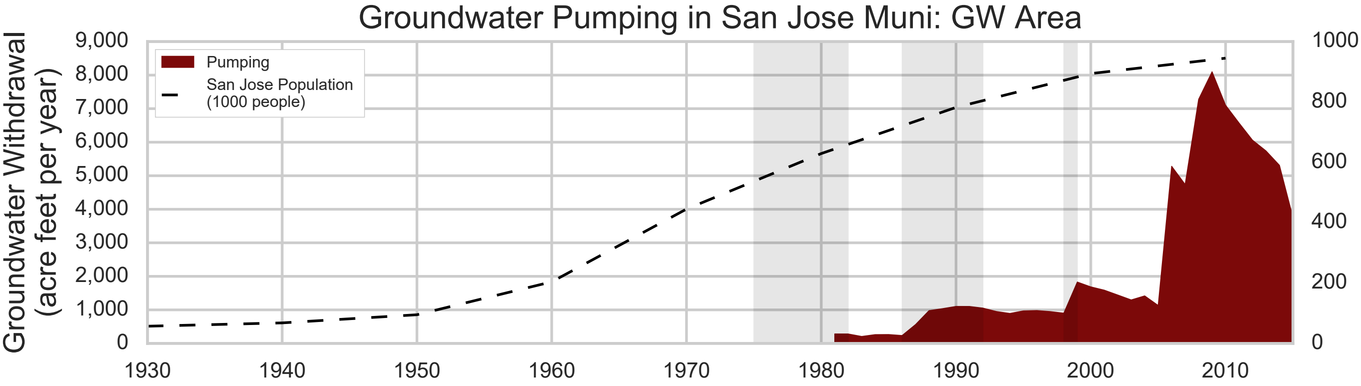


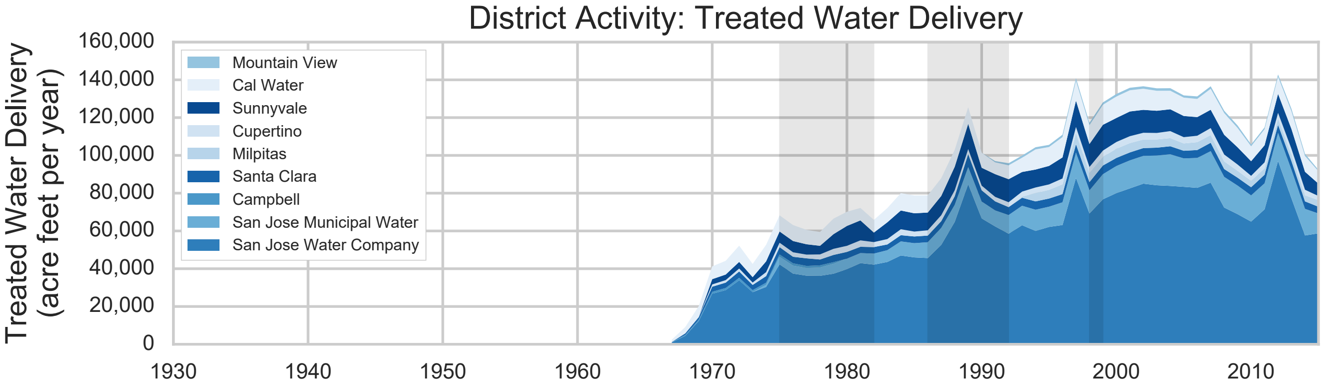
Observed Groundwater Elevations in SJ Water Company North: GW Area

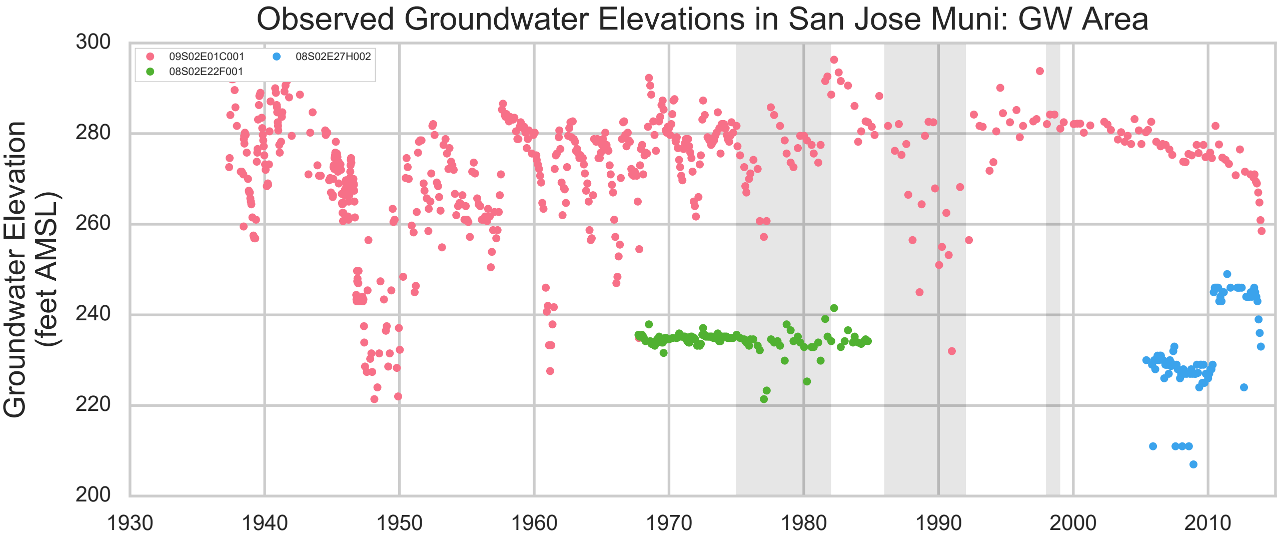
Pumping Area: San Jose Muni: GW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



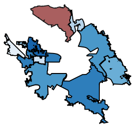

Cumulative Departure from Mean Annual Precipitation

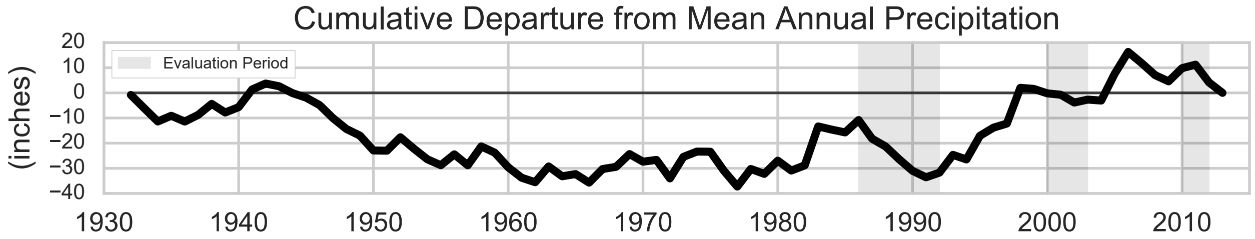

Groundwater Pumping in San Jose Muni: GW Area

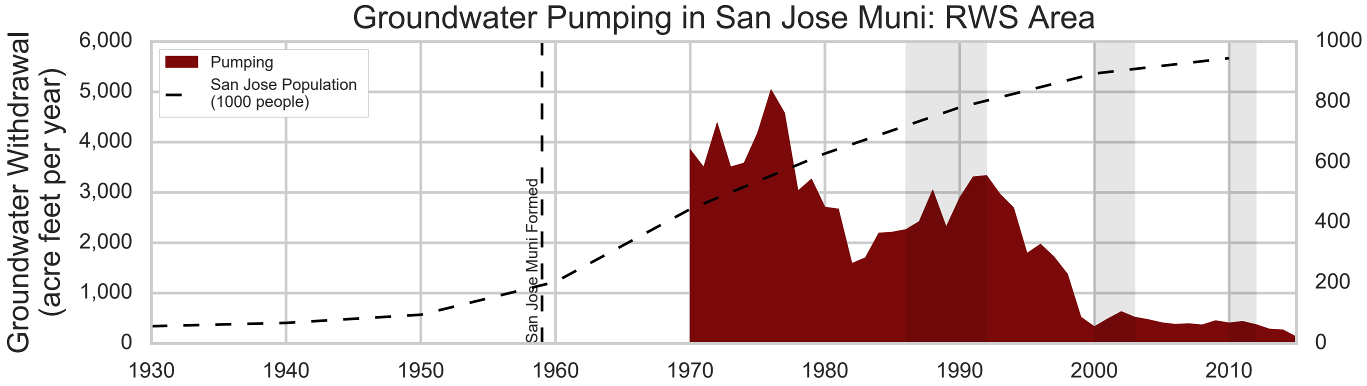

District Activity: Treated Water Delivery

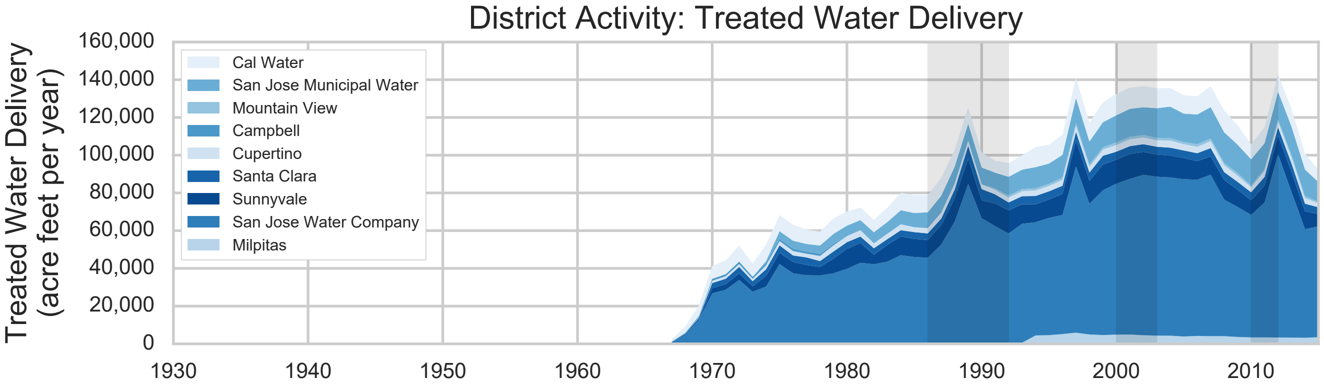

Observed Groundwater Elevations in San Jose Muni: GW Area

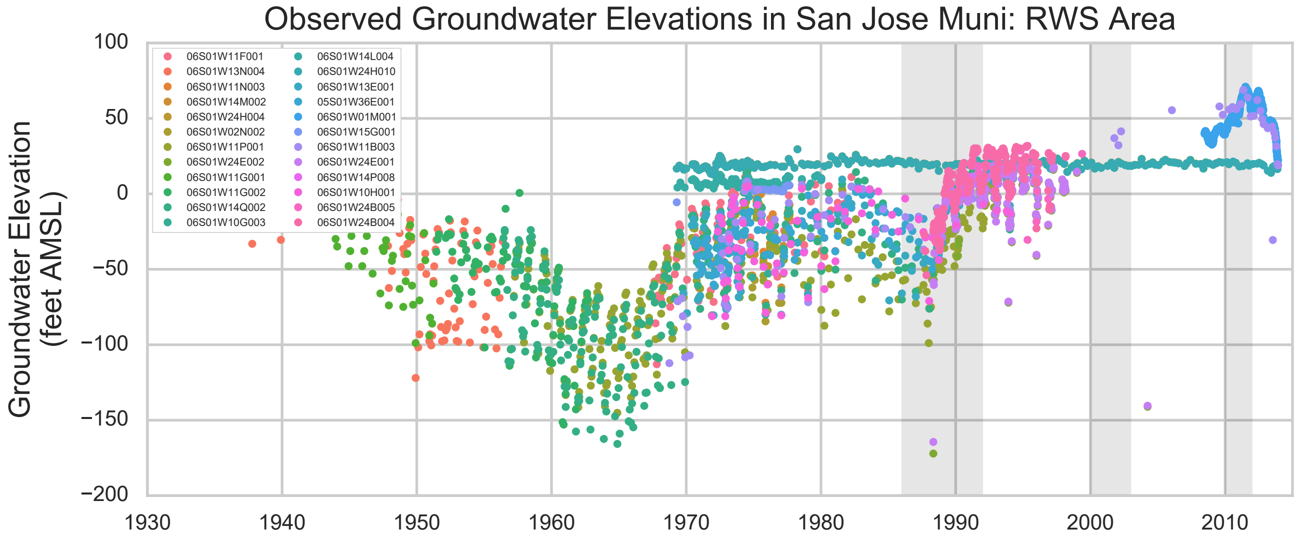
Pumping Area: San Jose Muni: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



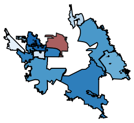


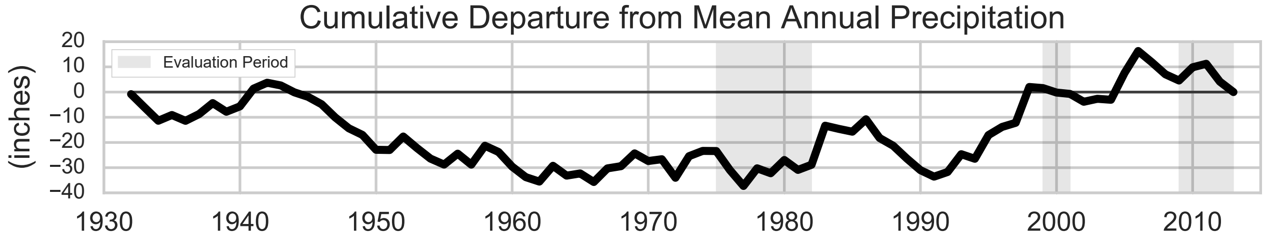


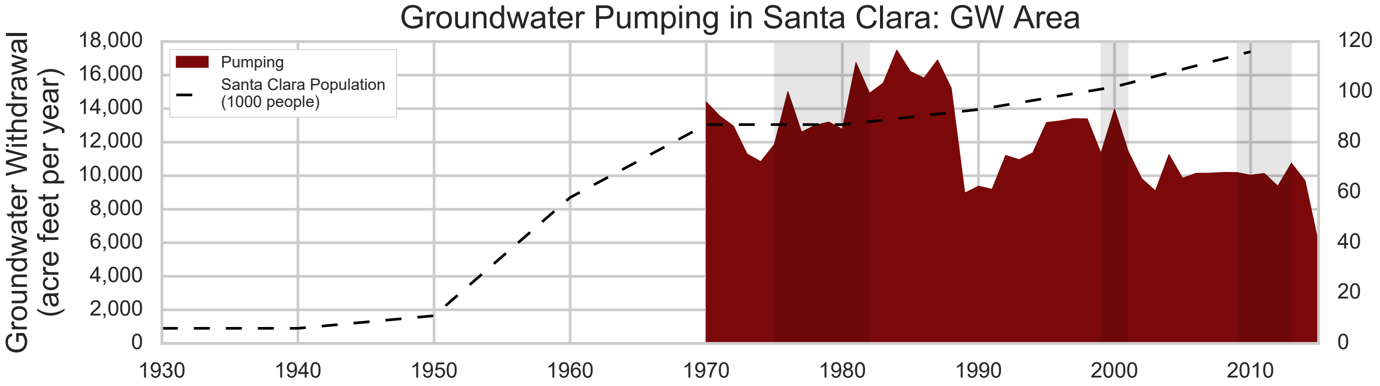


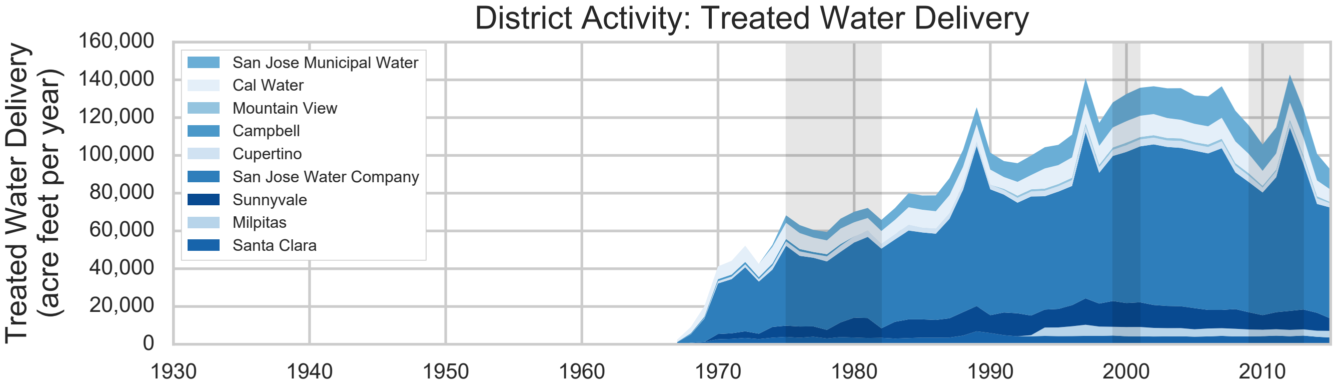


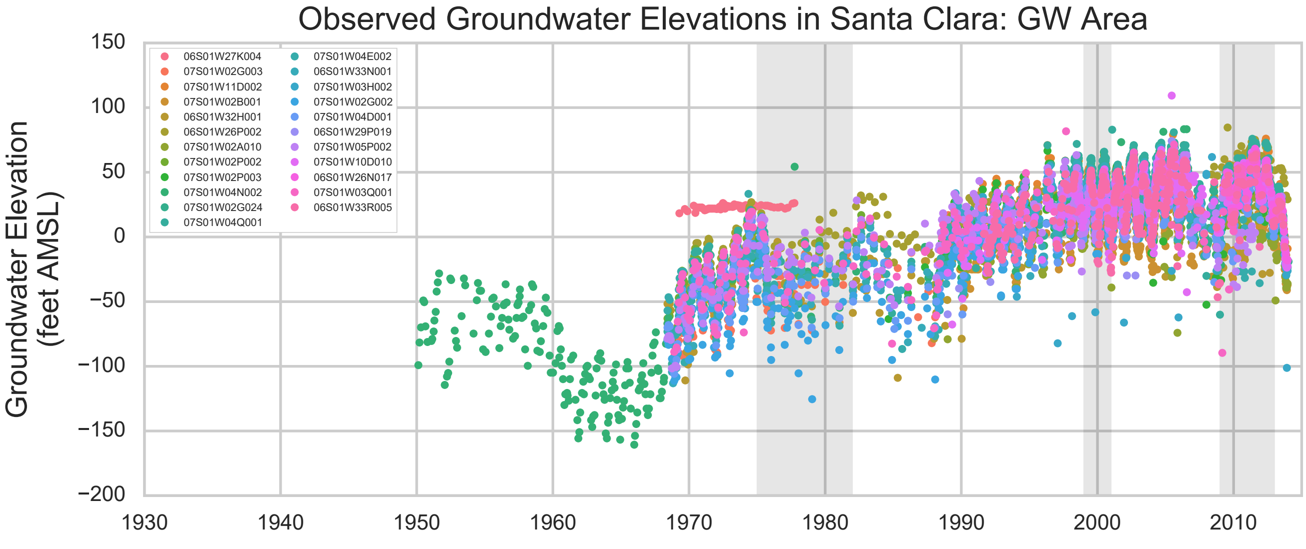
Pumping Area: Santa Clara: GW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



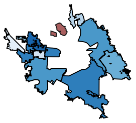

Cumulative Departure from Mean Annual Precipitation

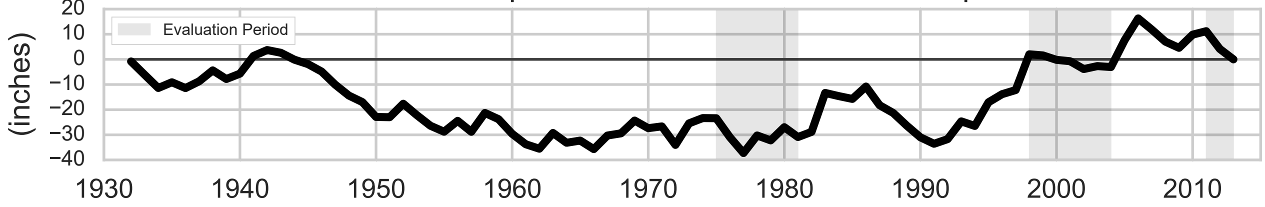

Groundwater Pumping in Santa Clara: GW Area


District Activity: Treated Water Delivery

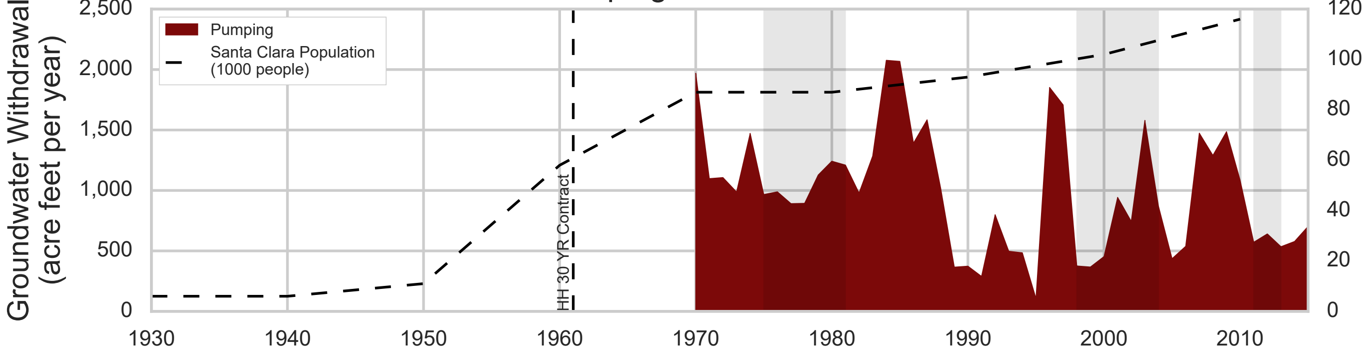

Observed Groundwater Elevations in Santa Clara: GW Area

Pumping Area: Santa Clara: RWS GW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells

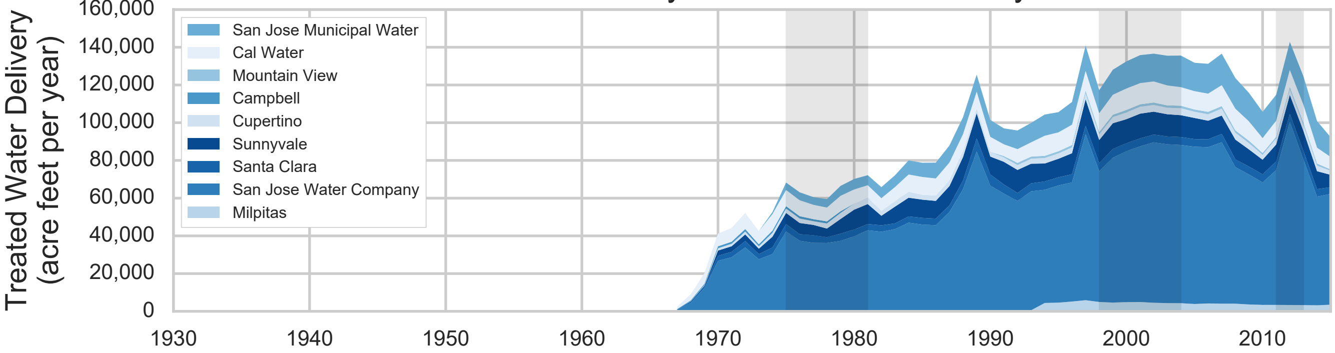




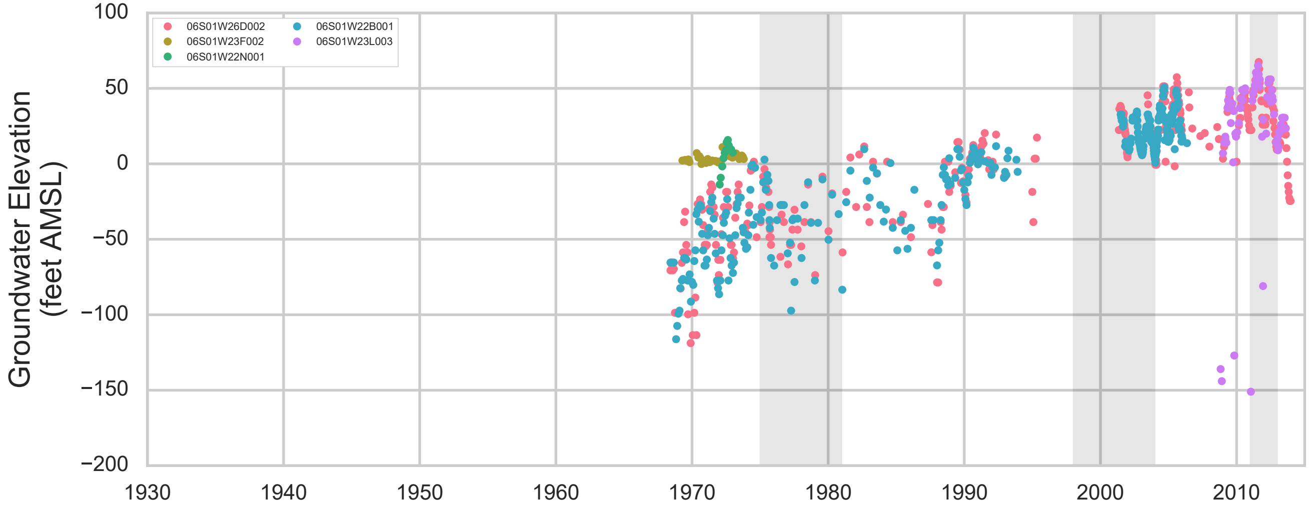
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Santa Clara: RWS GW Area

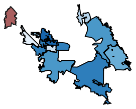


District Activity: Treated Water Delivery

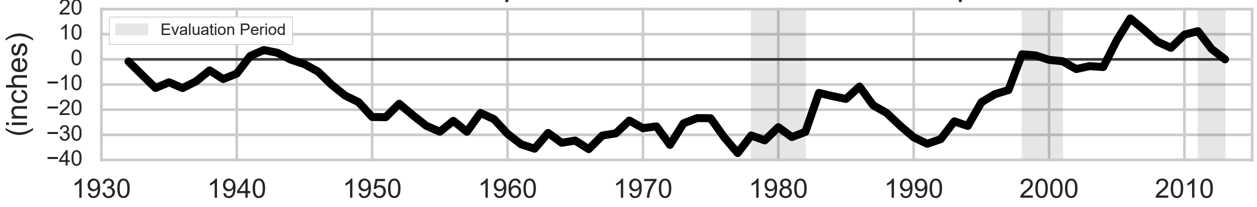


Observed Groundwater Elevations in Santa Clara: RWS GW Area

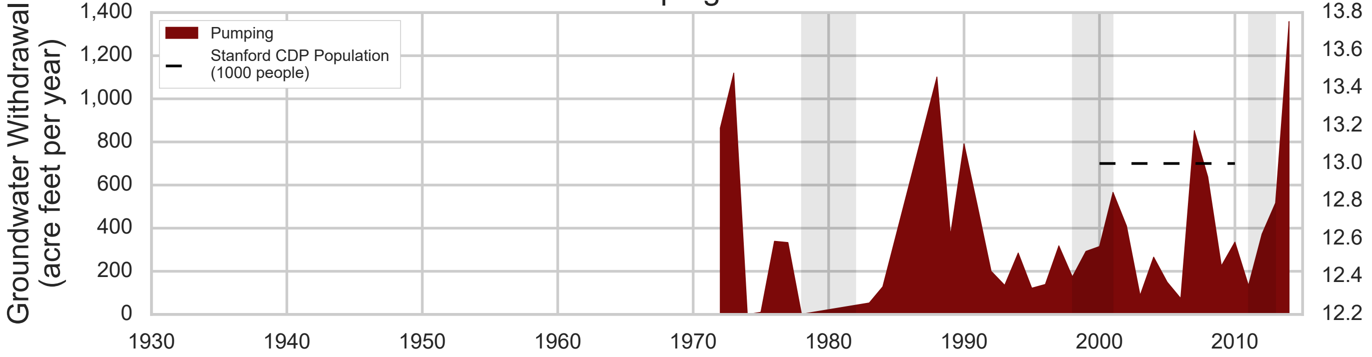
Pumping Area: Stanford: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



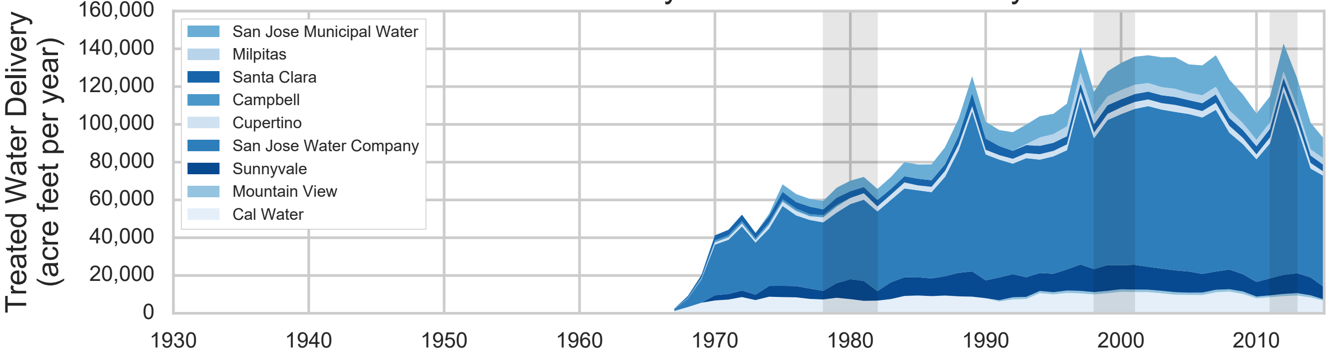
Cumulative Departure from Mean Annual Precipitation



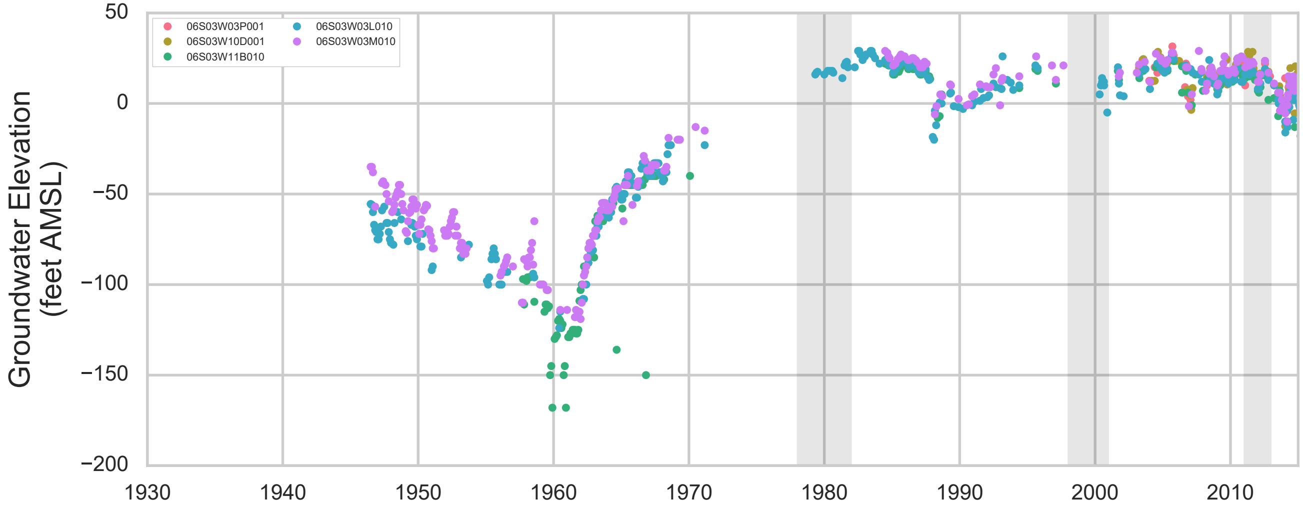
Groundwater Pumping in Stanford: RWS Area



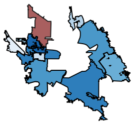
District Activity: Treated Water Delivery



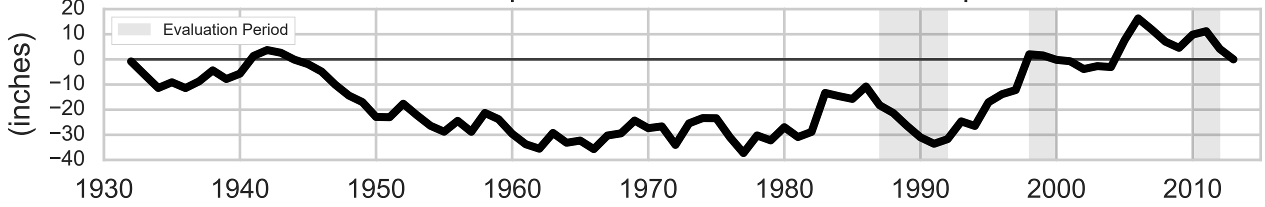
Observed Groundwater Elevations in Stanford: RWS Area



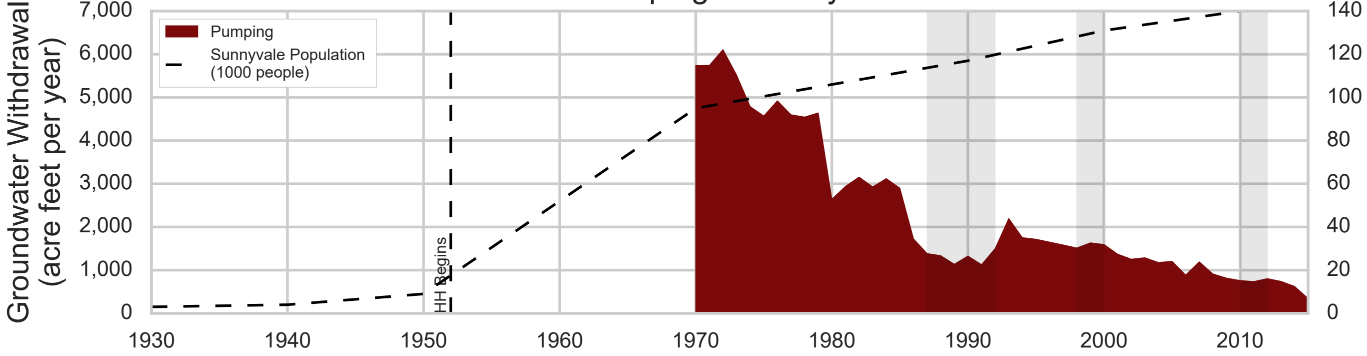
Pumping Area: Sunnyvale: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



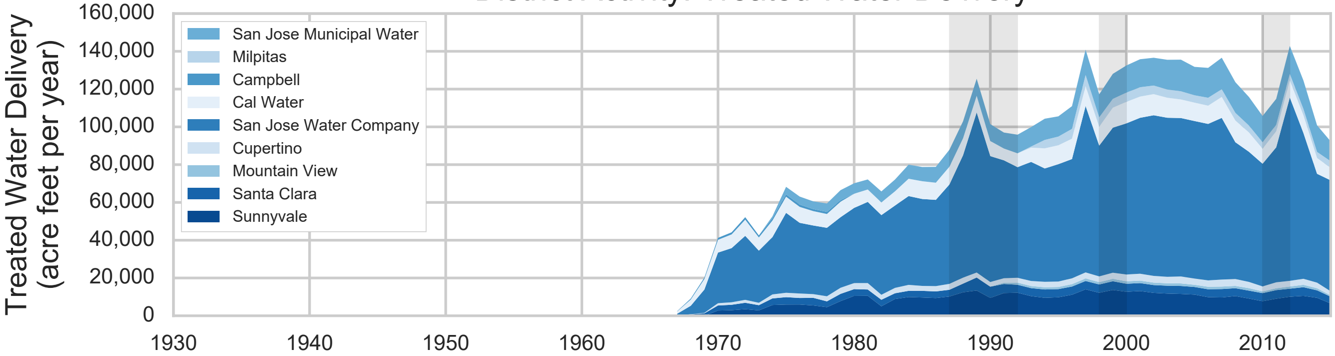
Cumulative Departure from Mean Annual Precipitation



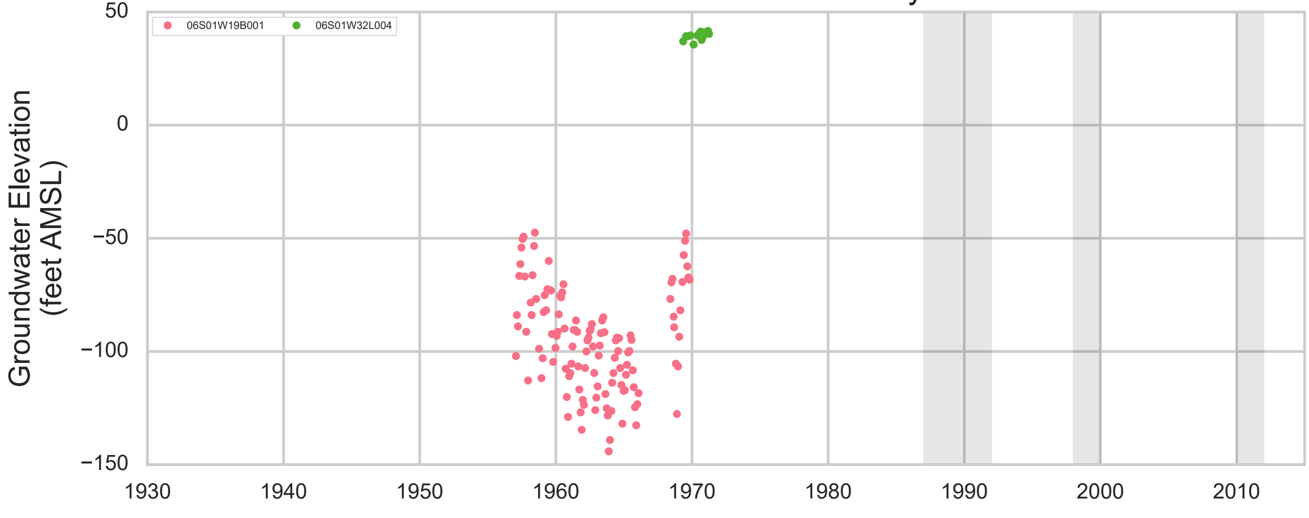
Groundwater Pumping in Sunnyvale: RWS Area



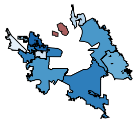
District Activity: Treated Water Delivery

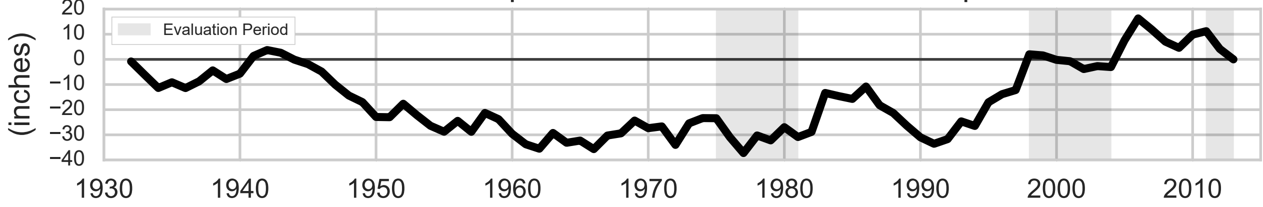


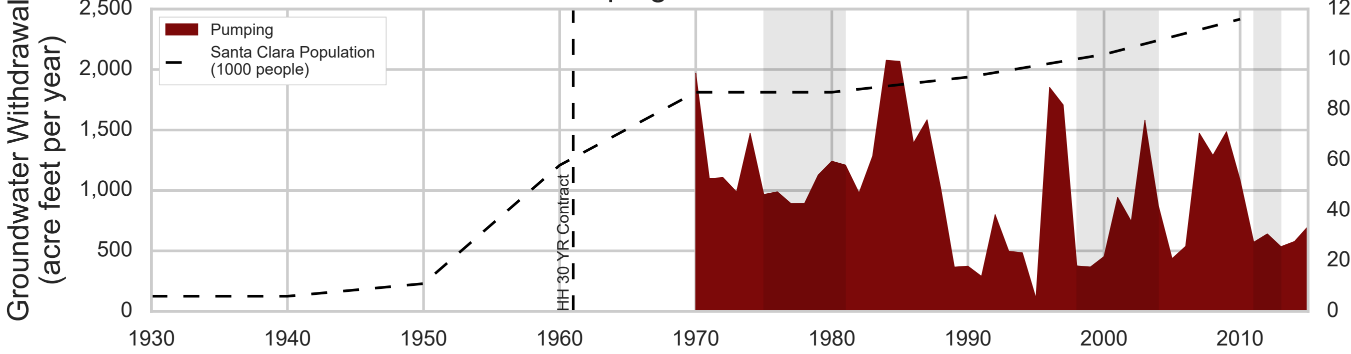
Observed Groundwater Elevations in Sunnyvale: RWS Area

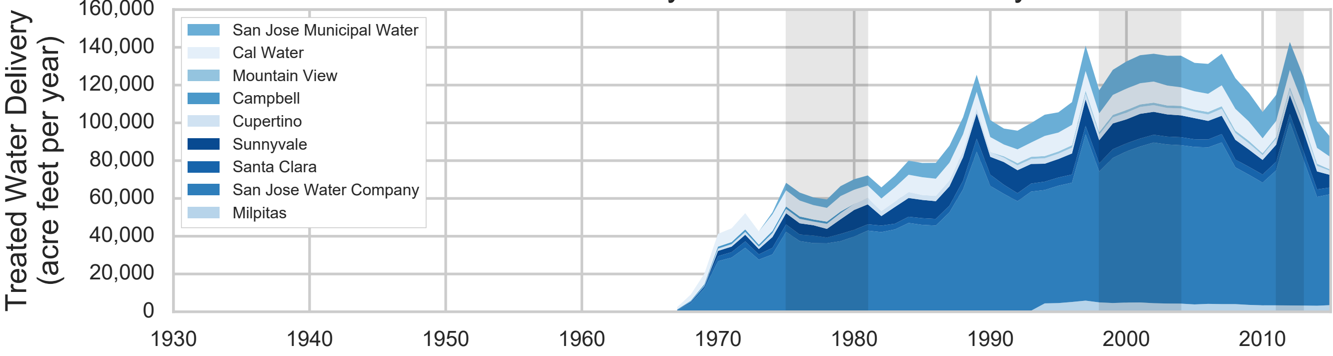


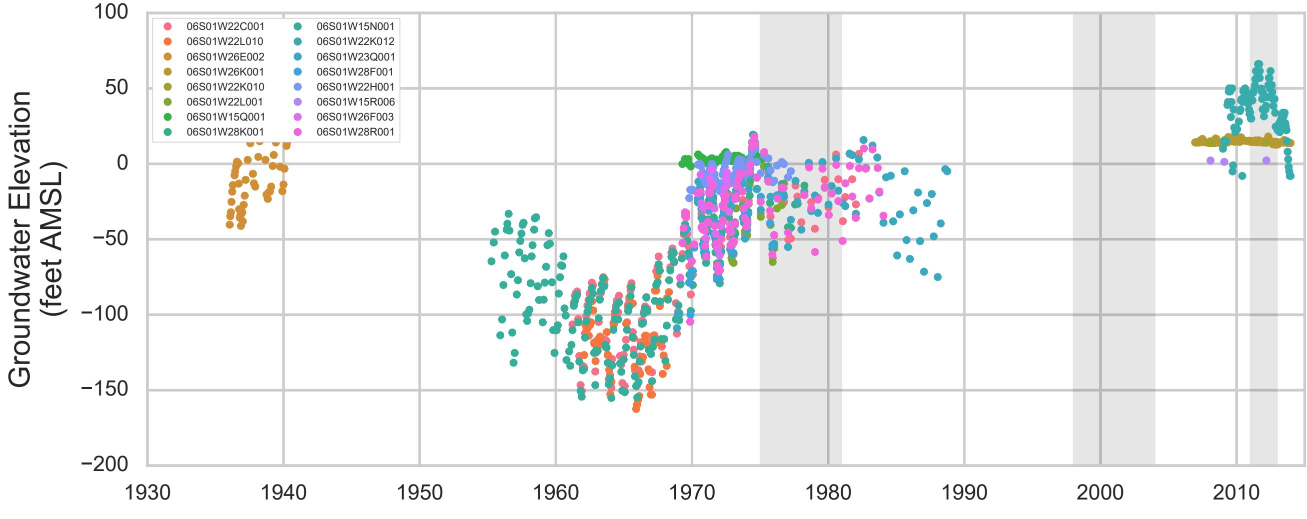
Pumping Area: Santa Clara: RWS GW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells



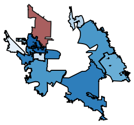

Cumulative Departure from Mean Annual Precipitation

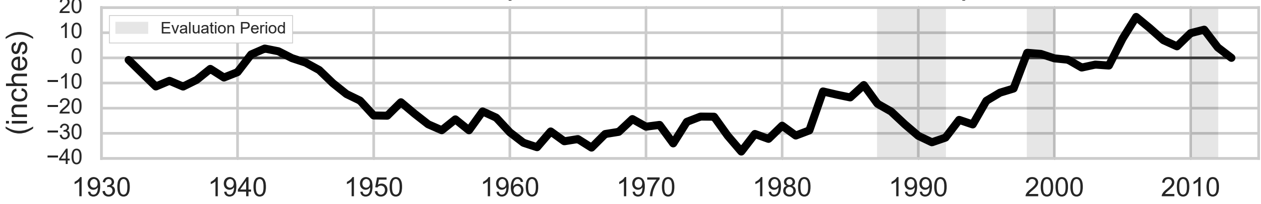

Groundwater Pumping in Santa Clara: RWS GW Area

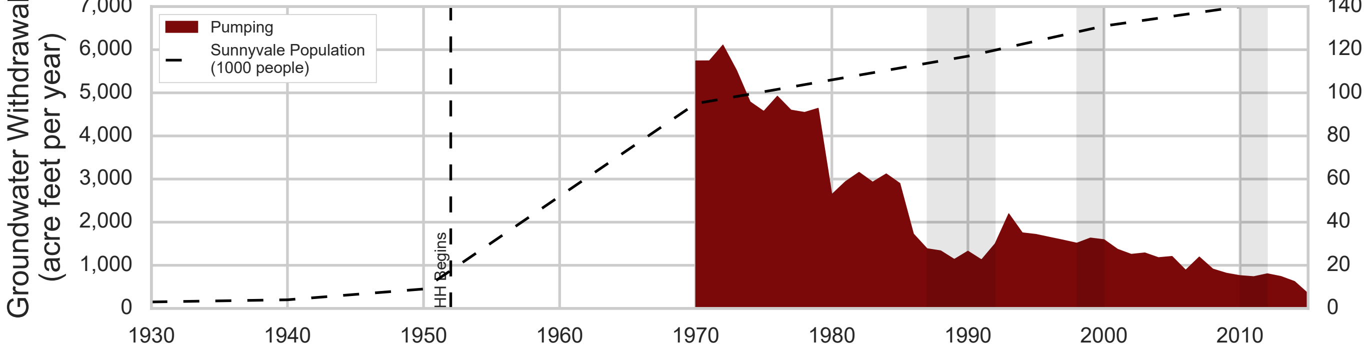

District Activity: Treated Water Delivery

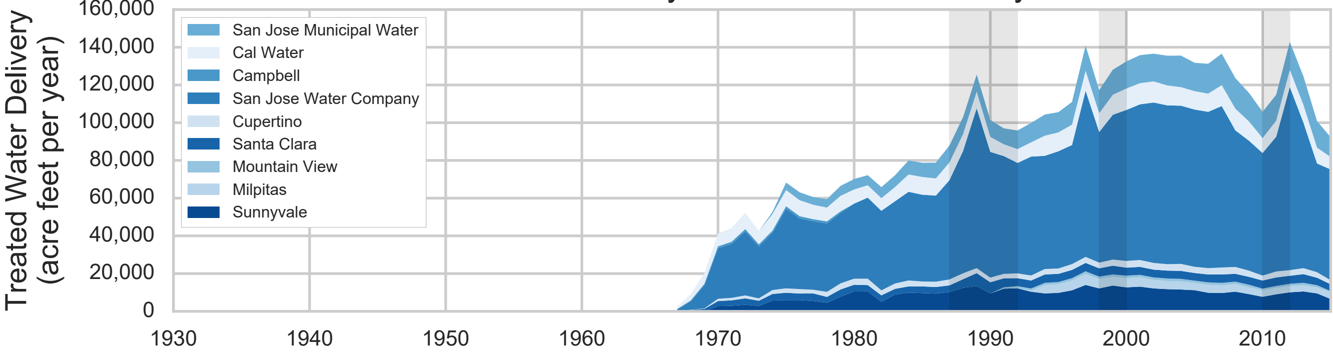

Observed Groundwater Elevations in Santa Clara: RWS GW Area

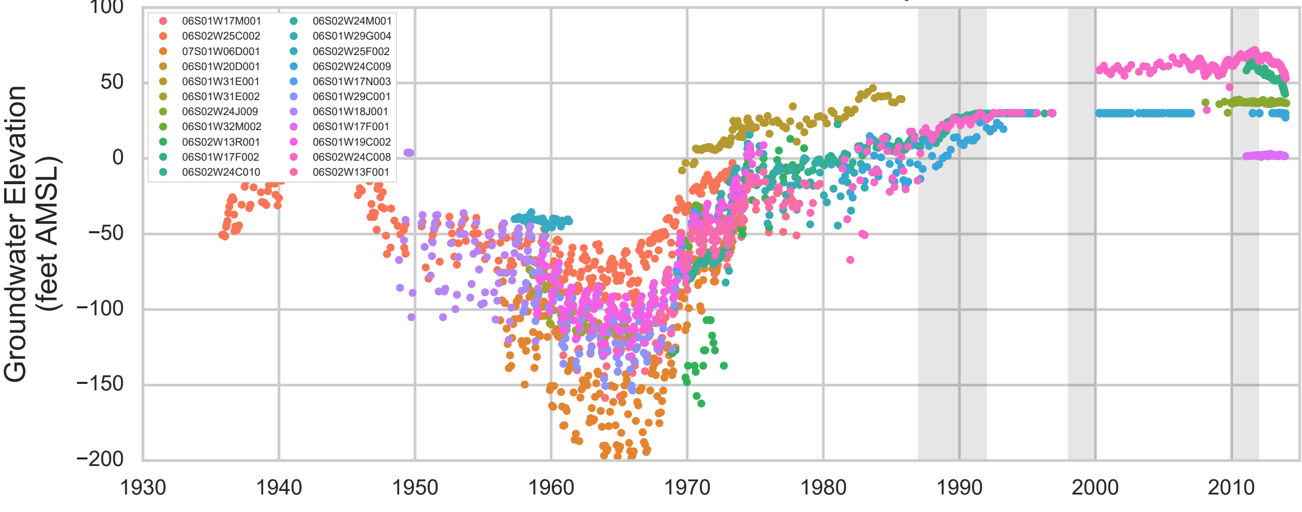
Pumping Area: Sunnyvale: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitoring Wells




Cumulative Departure from Mean Annual Precipitation


Groundwater Pumping in Sunnyvale: RWS Area


District Activity: Treated Water Delivery

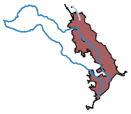

Observed Groundwater Elevations in Sunnyvale: RWS Area

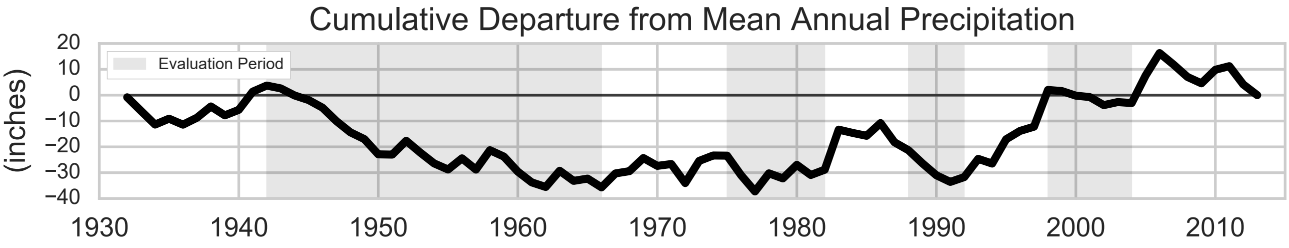
MONTGOMERY
& ASSOCIATES

Appendix E

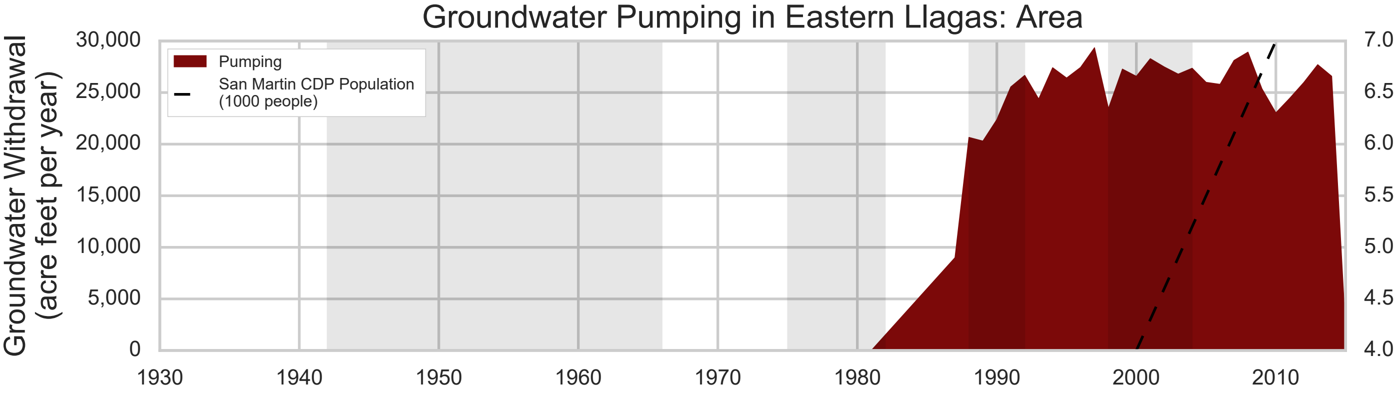
Groundwater Level Trends in Monitoring Wells to Evaluate Benefits from Managed Aquifer Recharge in Llagas Subbasin

Pumping Area: Eastern Llagas:
Activity: Llagas Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

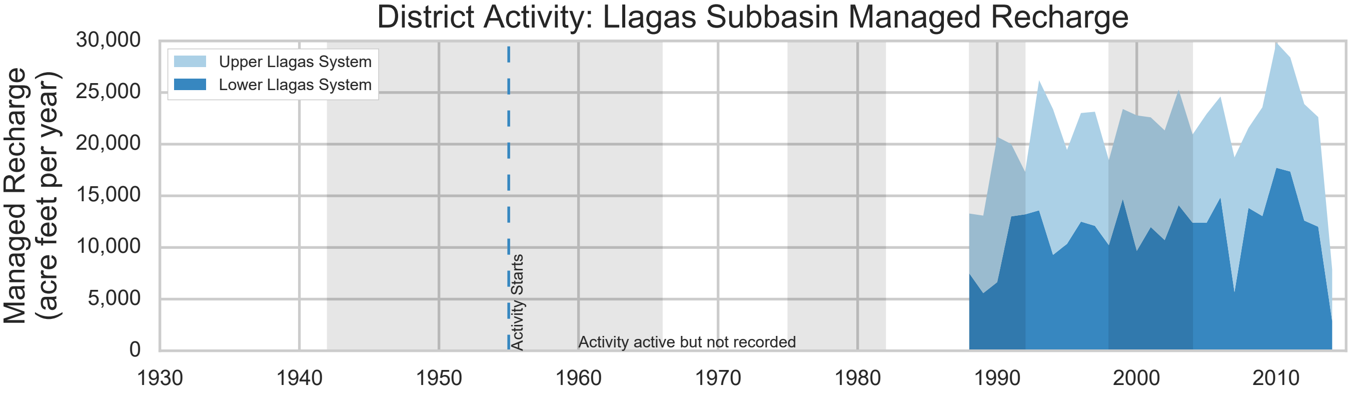




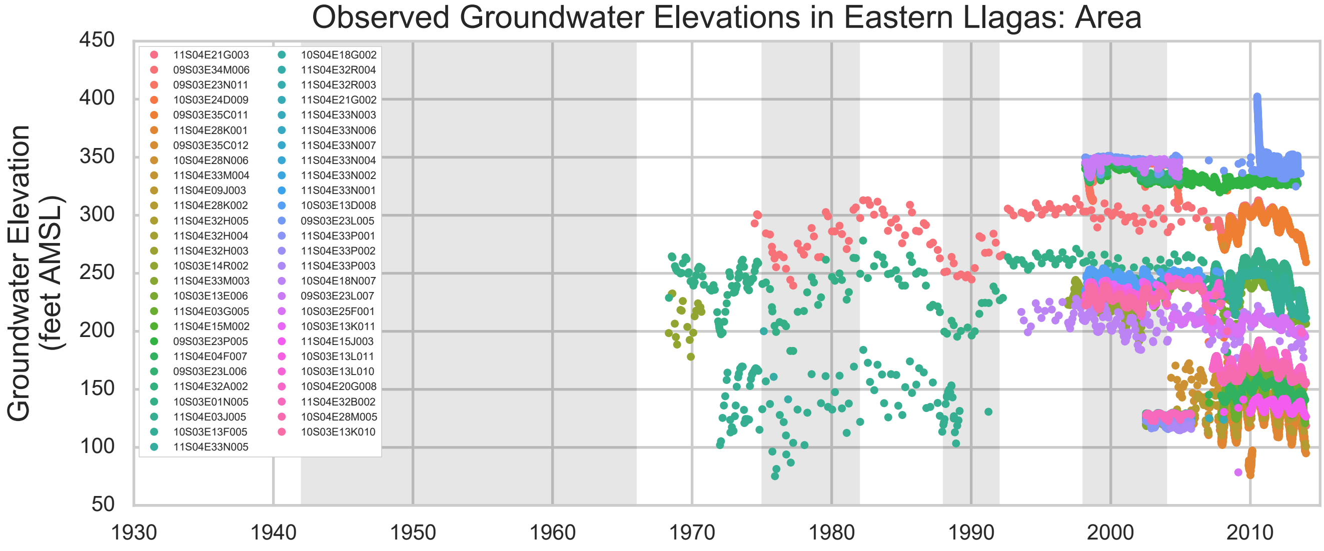
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Eastern Llagas: Area

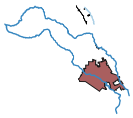


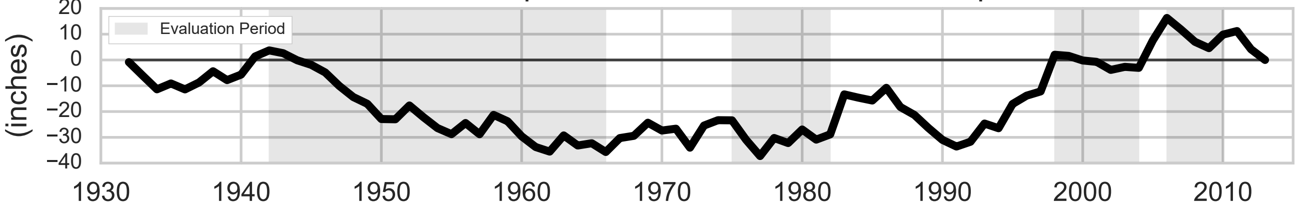
District Activity: Llagas Subbasin Managed Recharge



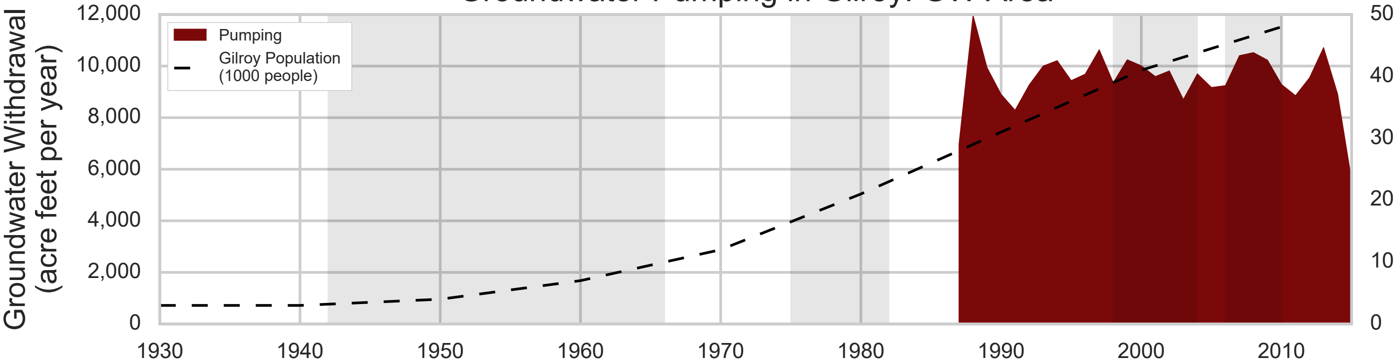
Observed Groundwater Elevations in Eastern Llagas: Area

Pumping Area: Gilroy: GW
Activity: Llagas Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells

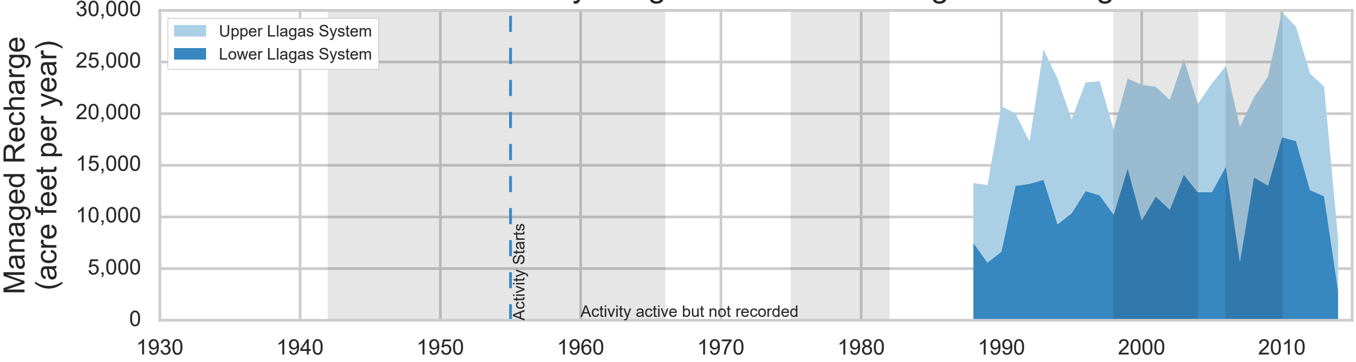




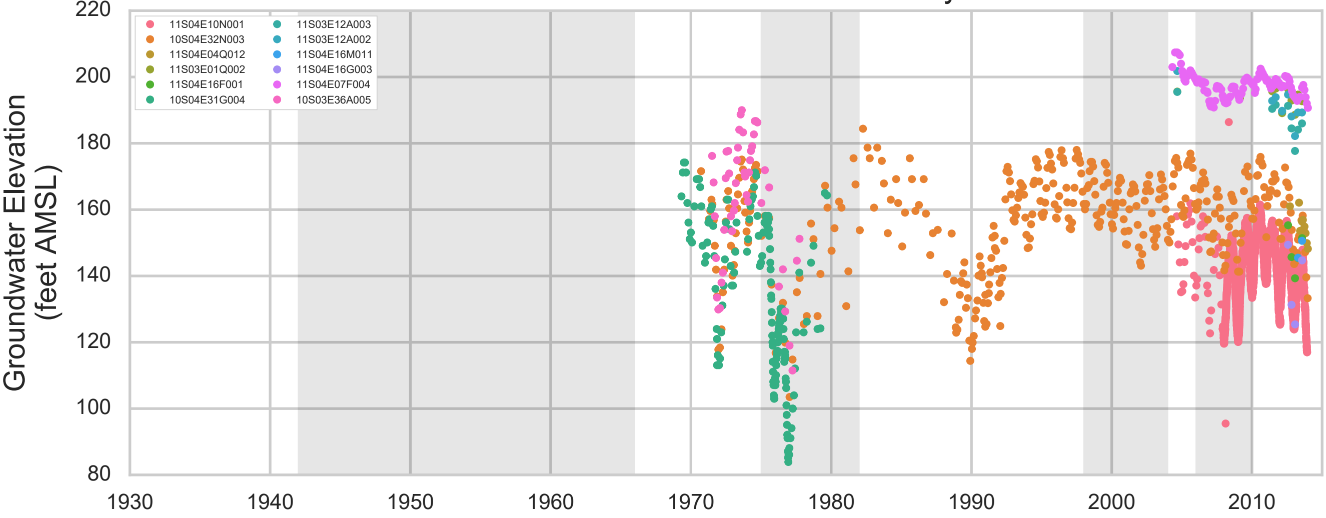
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Gilroy: GW Area

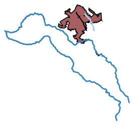


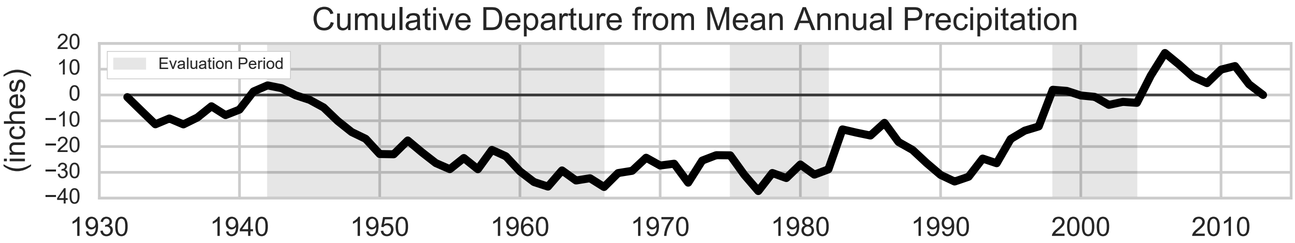
District Activity: Llagas Subbasin Managed Recharge

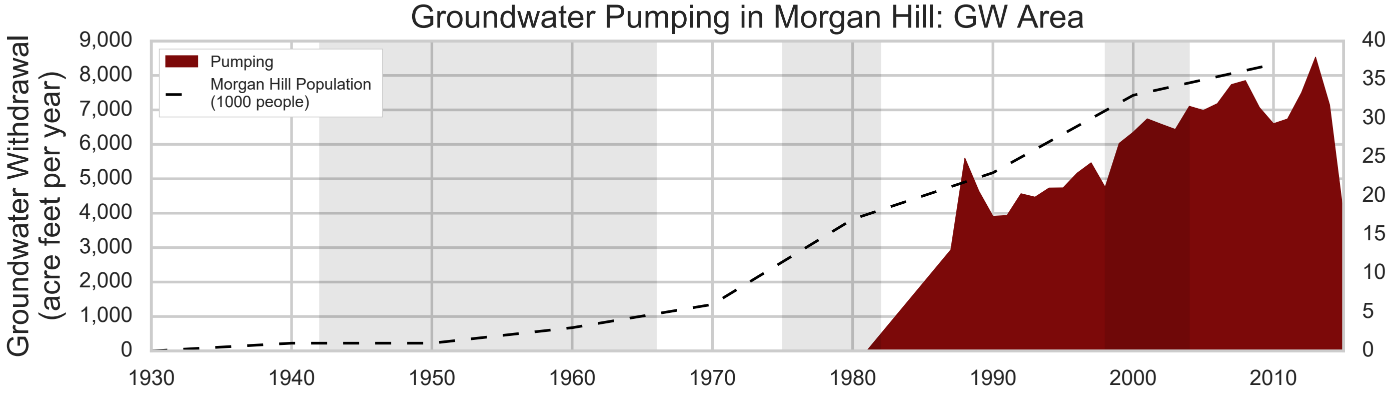


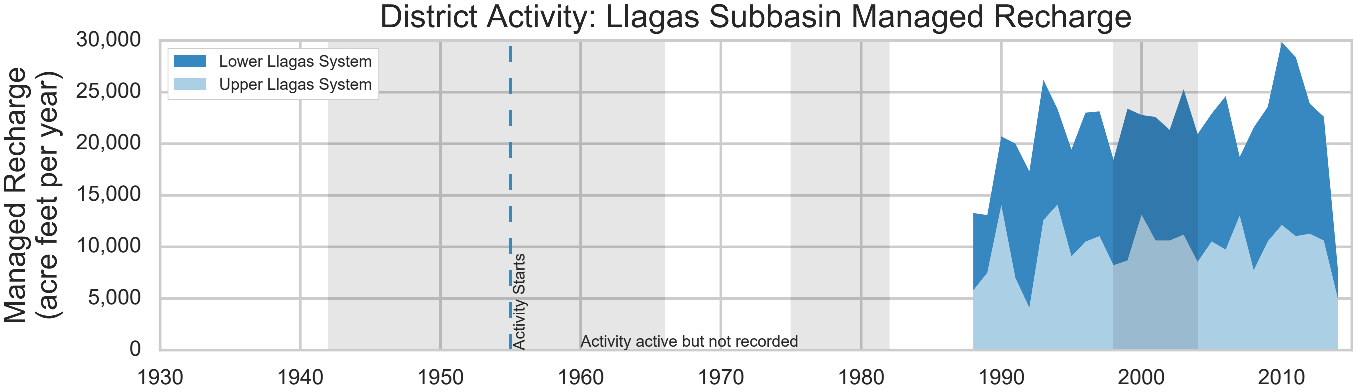
Observed Groundwater Elevations in Gilroy: GW Area

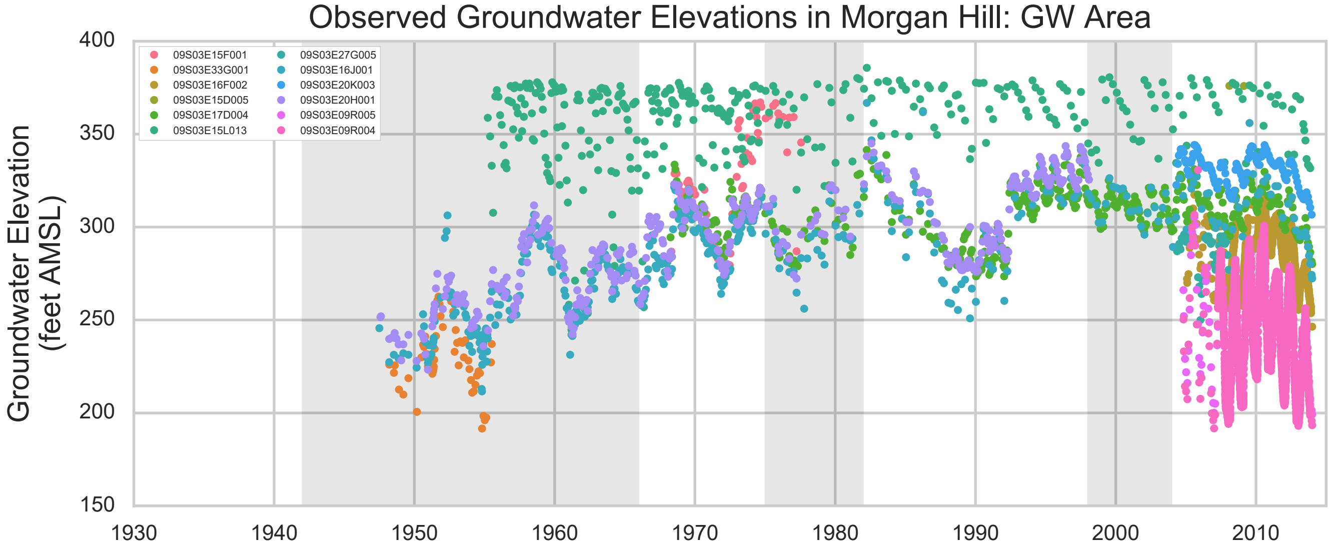
Pumping Area: Morgan Hill: GW
Activity: Llagas Subbasin Managed Recharge
Groundwater Level Data from: Monitoring Wells




Cumulative Departure from Mean Annual Precipitation


Groundwater Pumping in Morgan Hill: GW Area

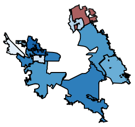

District Activity: Llagas Subbasin Managed Recharge

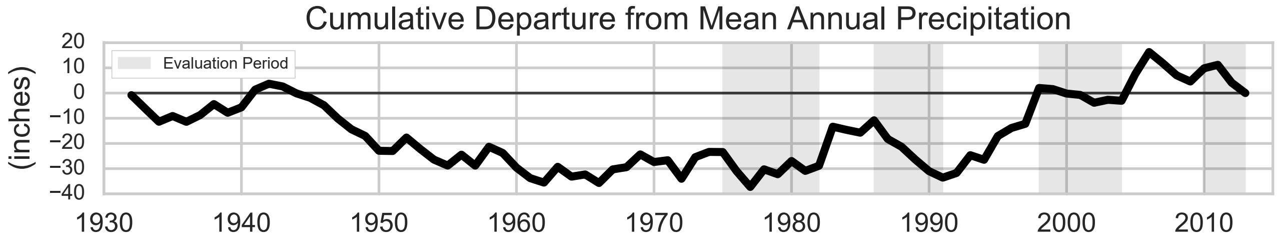

Observed Groundwater Elevations in Morgan Hill: GW Area

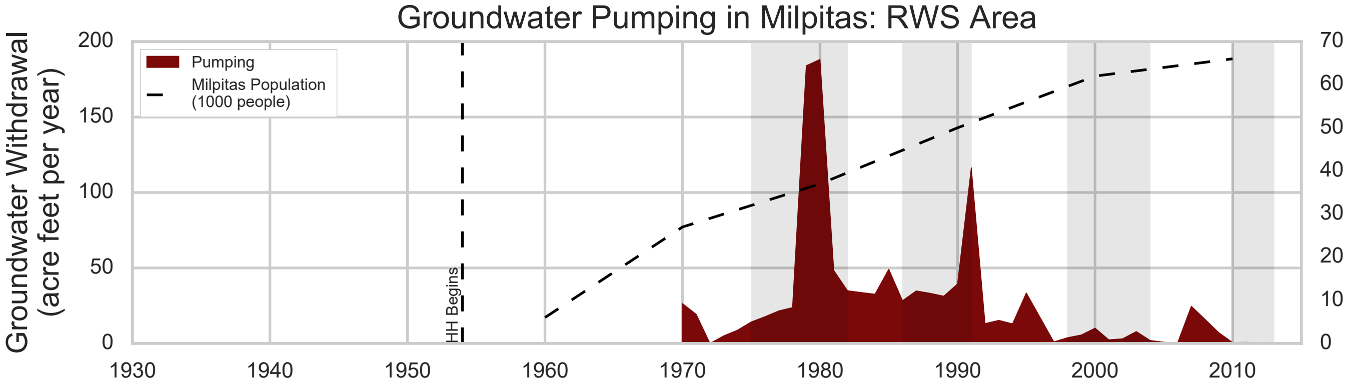
Appendix F

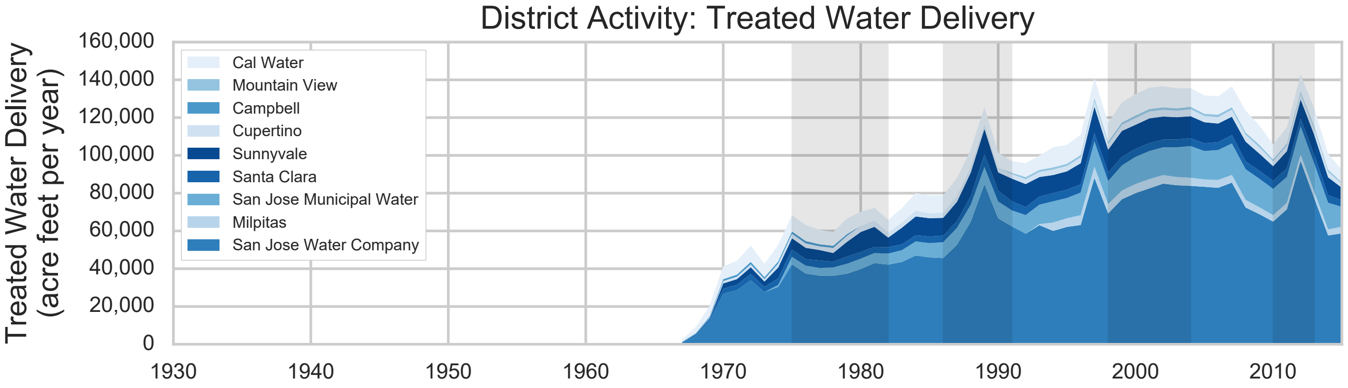
Groundwater Level Trends in Production Wells to Evaluate Benefits from District Activities in Select Pumping Areas

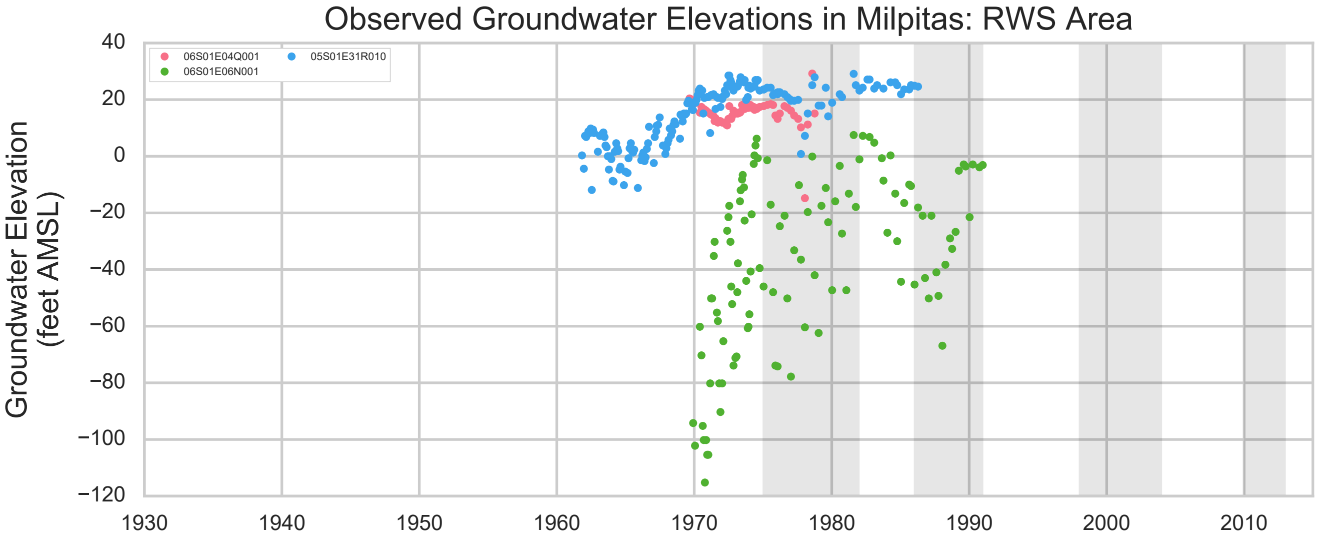
Pumping Area: Milpitas: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitored Pumping Wells



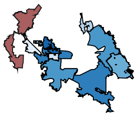


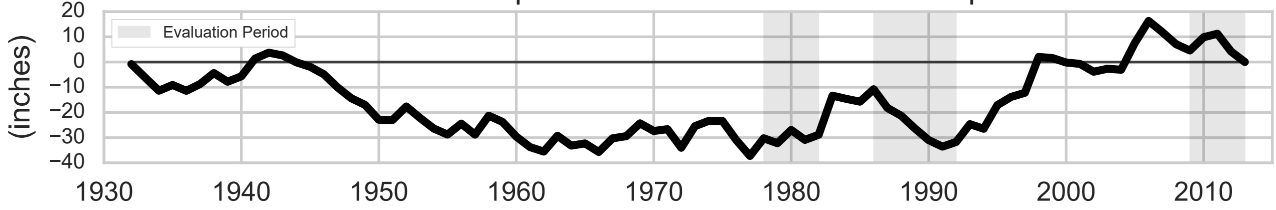




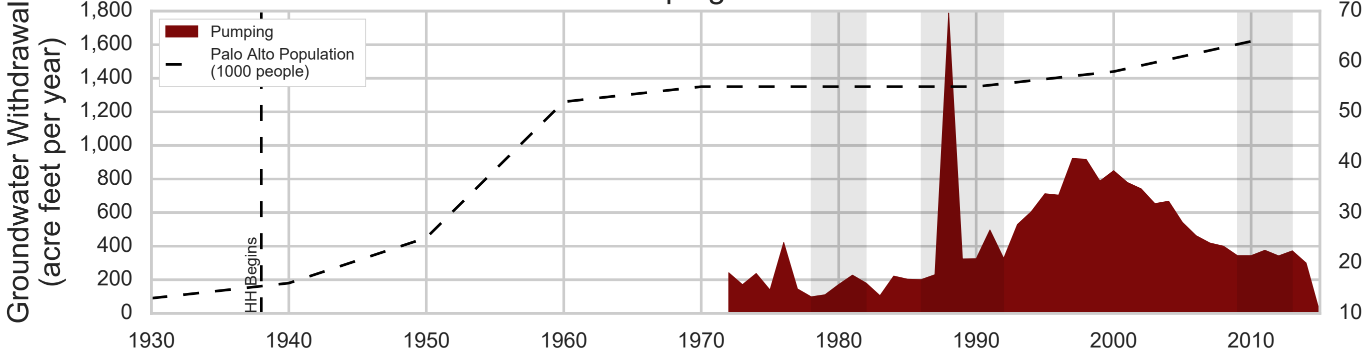


Pumping Area: Palo Alto: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitored Pumping Wells

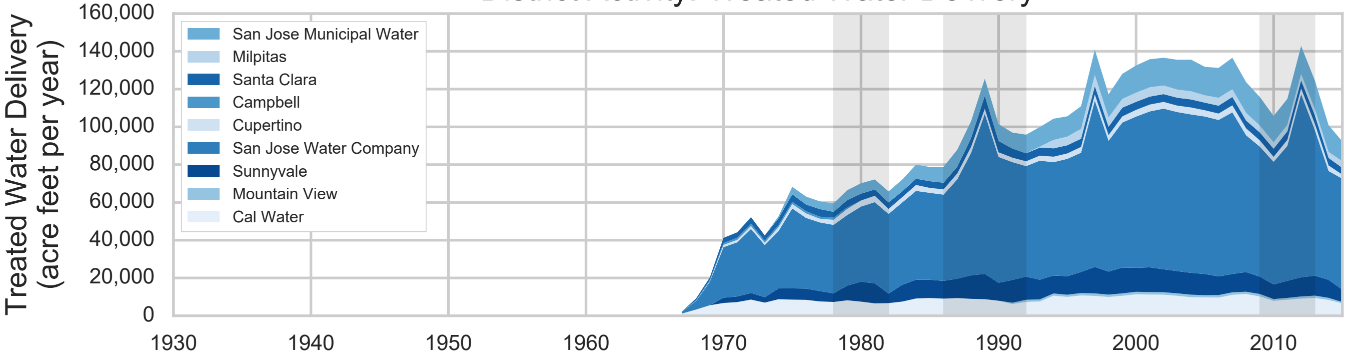




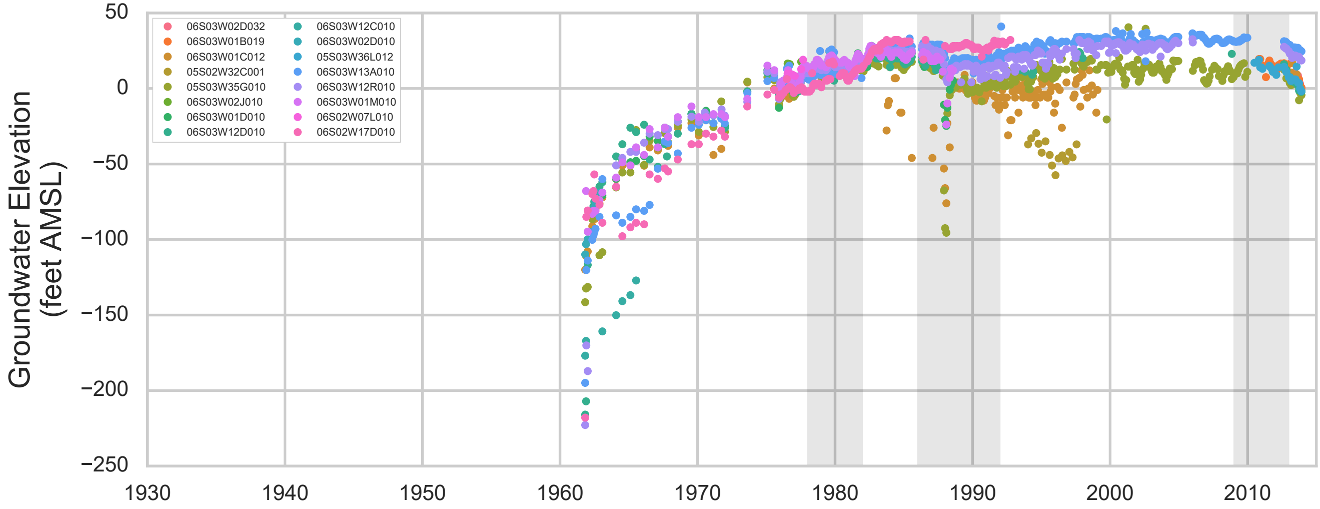
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Palo Alto: RWS Area

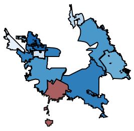


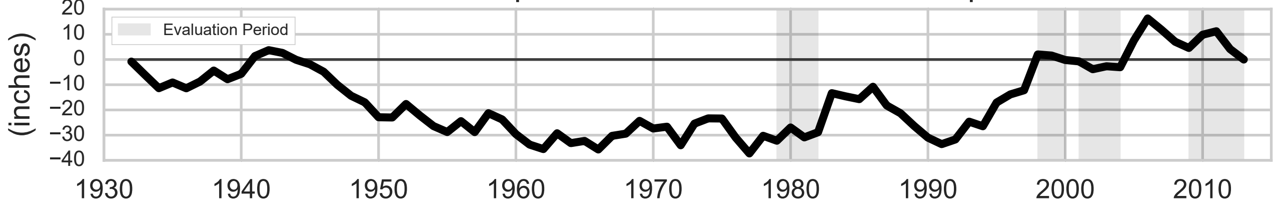
District Activity: Treated Water Delivery

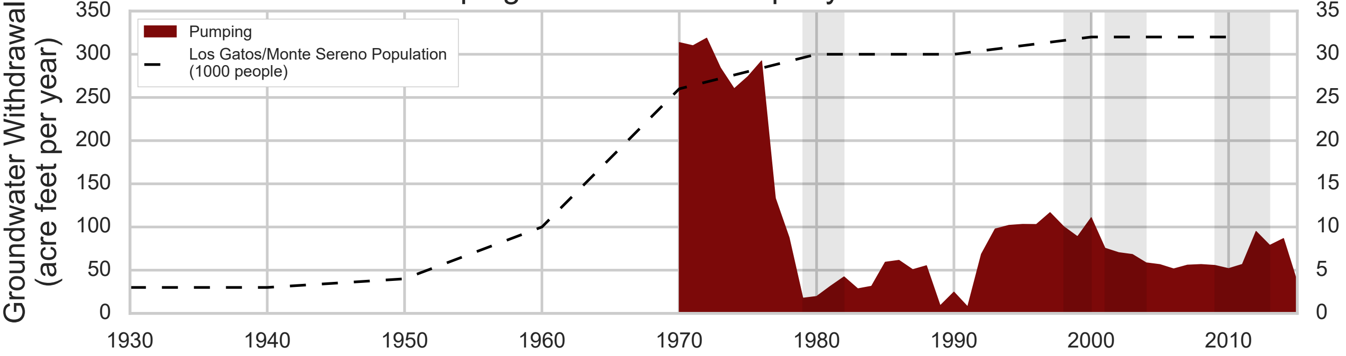


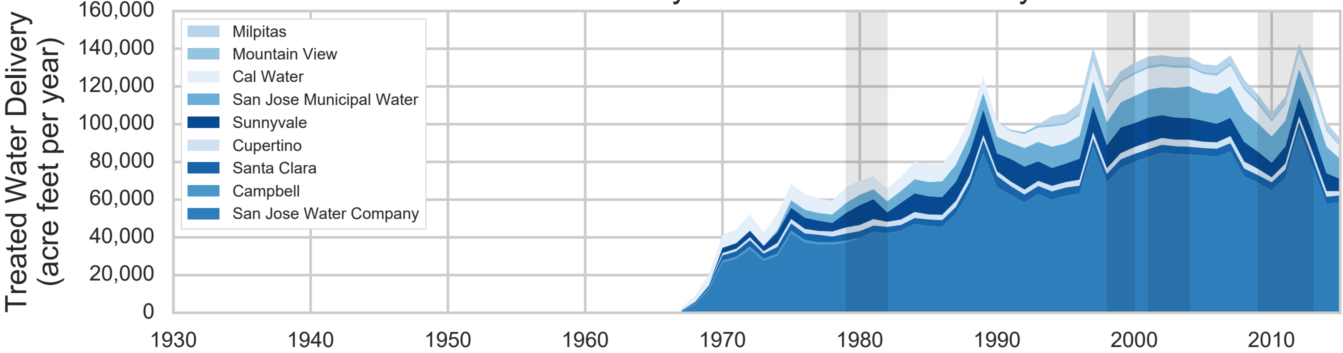
Observed Groundwater Elevations in Palo Alto: RWS Area

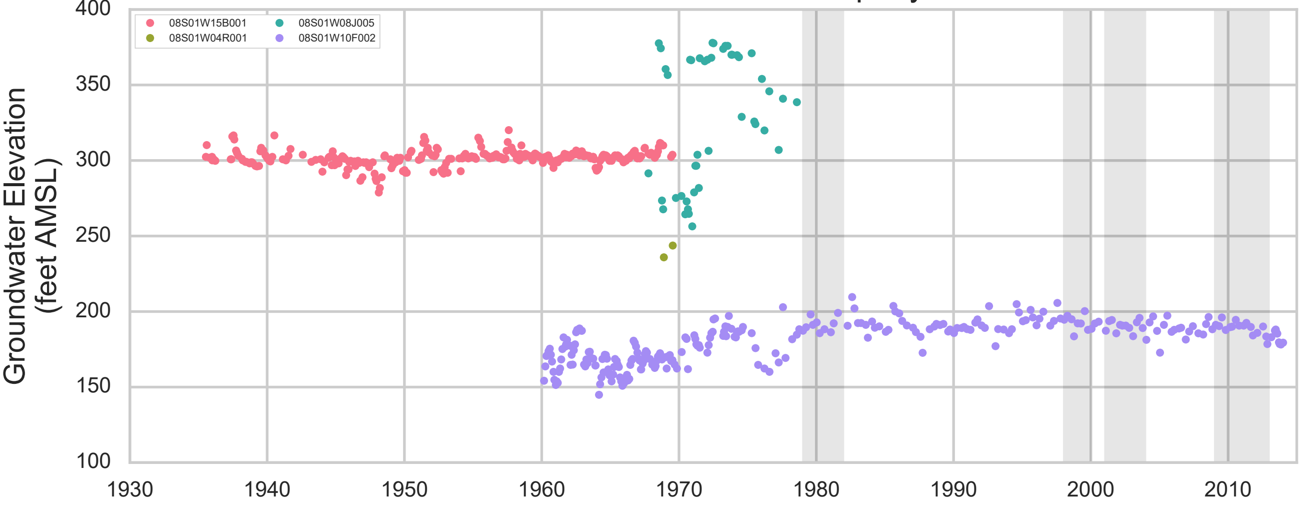
Pumping Area: SJ Water Company Los Gatos: Local SW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitored Pumping Wells



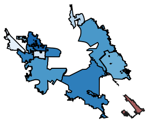

Cumulative Departure from Mean Annual Precipitation

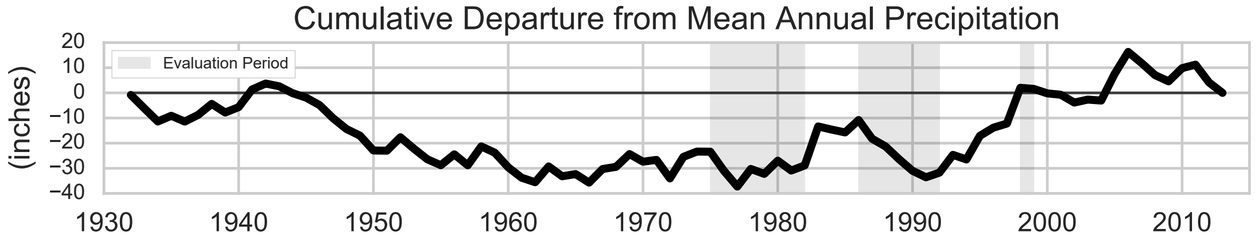

Groundwater Pumping in SJ Water Company Los Gatos: Local SW Area

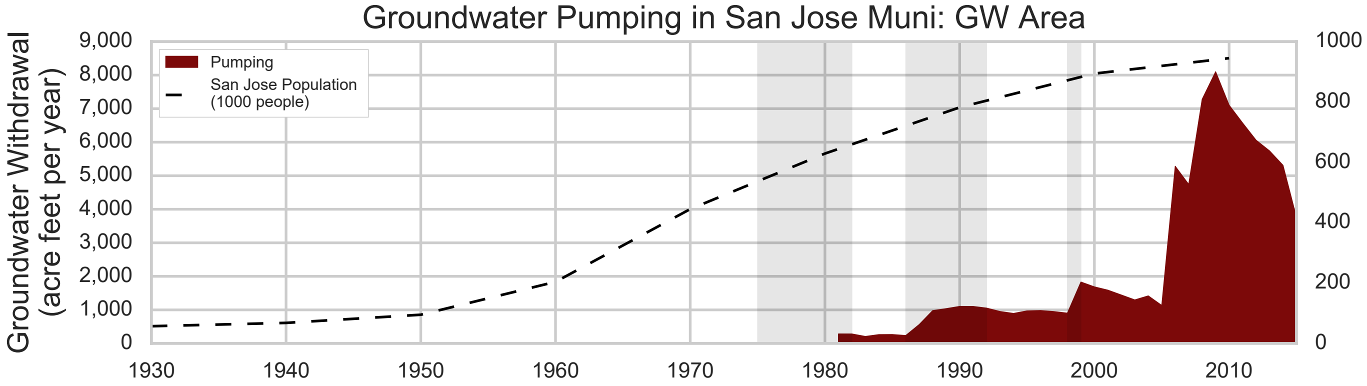

District Activity: Treated Water Delivery

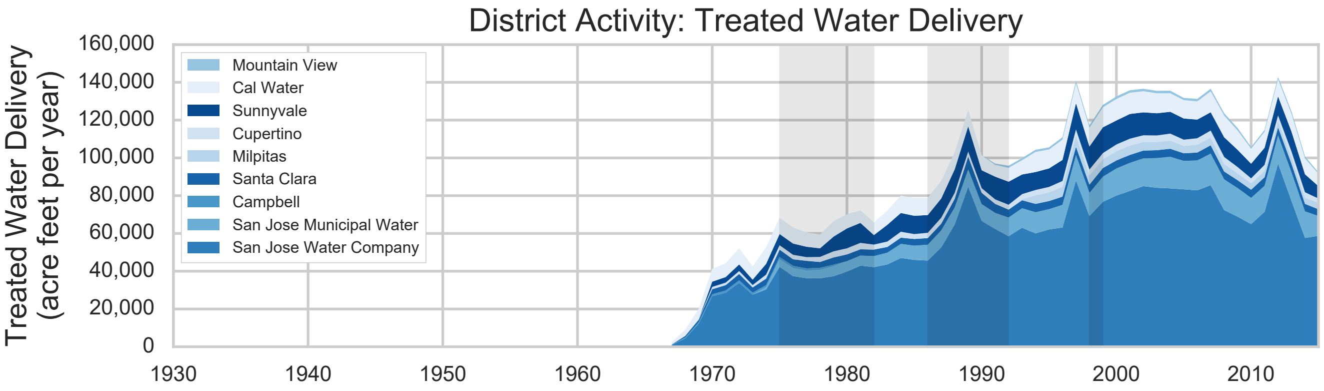

Observed Groundwater Elevations in SJ Water Company Los Gatos: Local SW Area

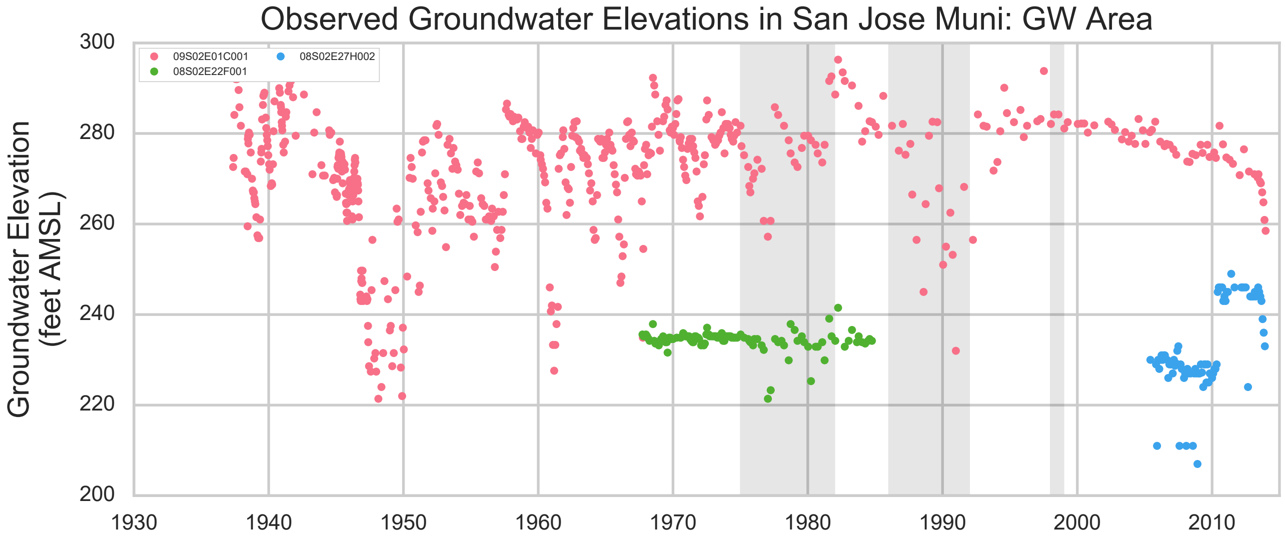
Pumping Area: San Jose Muni: GW
Activity: Treated Water Delivery
Groundwater Level Data from: Monitored Pumping Wells



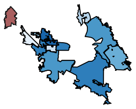

Cumulative Departure from Mean Annual Precipitation

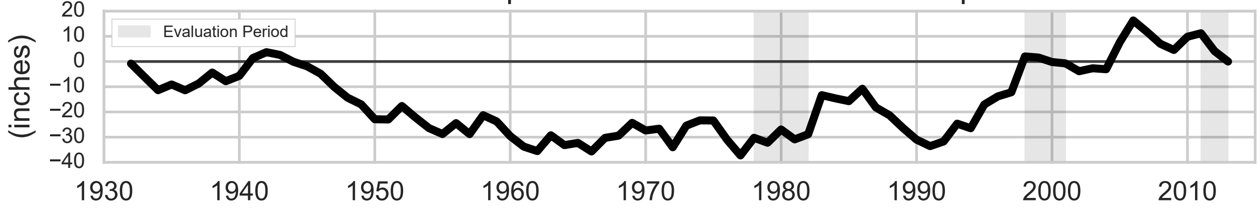

Groundwater Pumping in San Jose Muni: GW Area

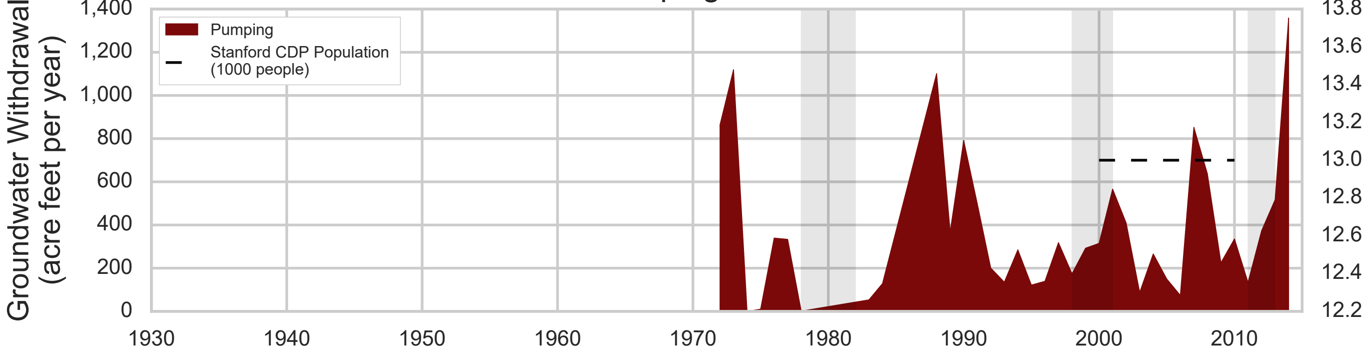

District Activity: Treated Water Delivery

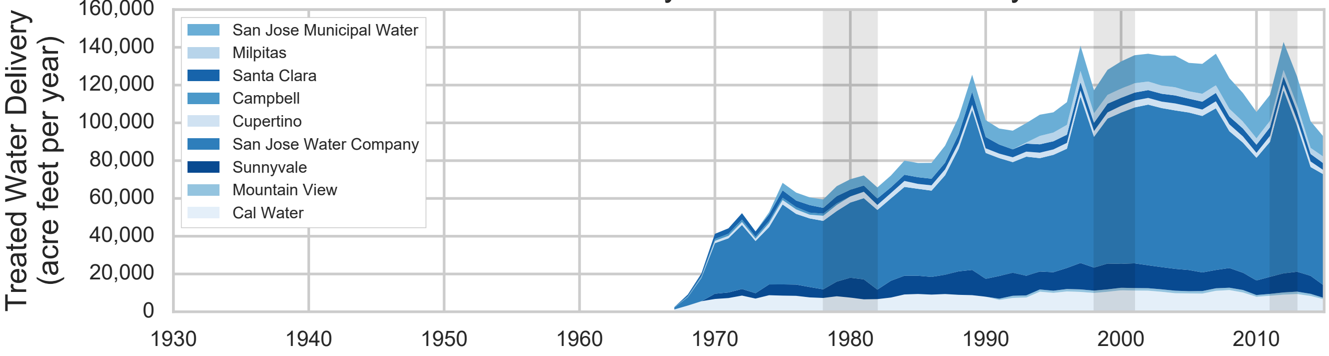

Observed Groundwater Elevations in San Jose Muni: GW Area

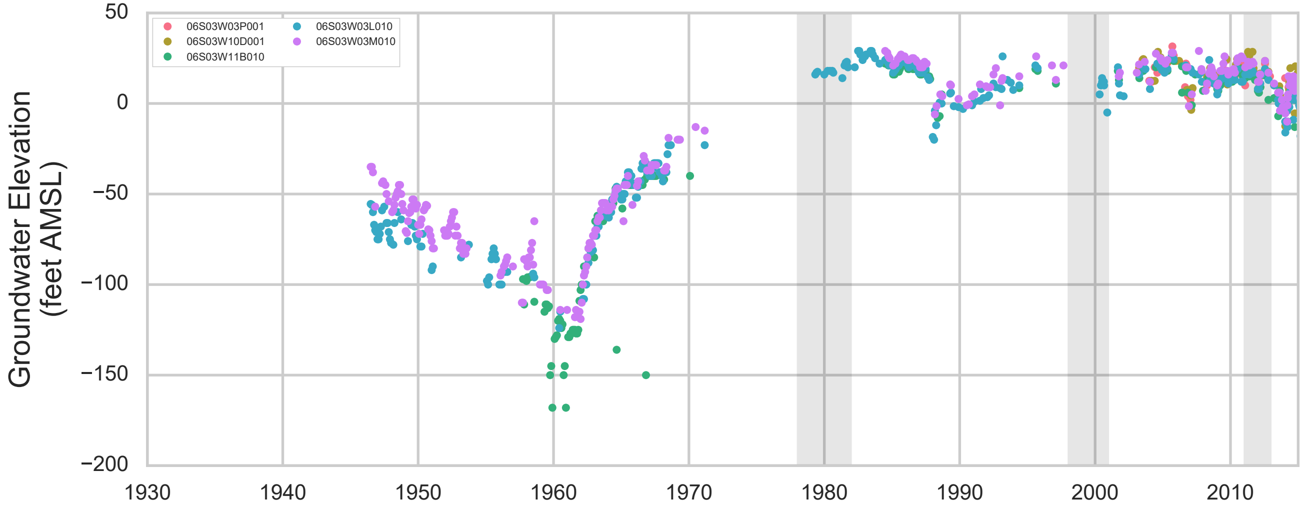
Pumping Area: Stanford: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitored Pumping Wells




Cumulative Departure from Mean Annual Precipitation

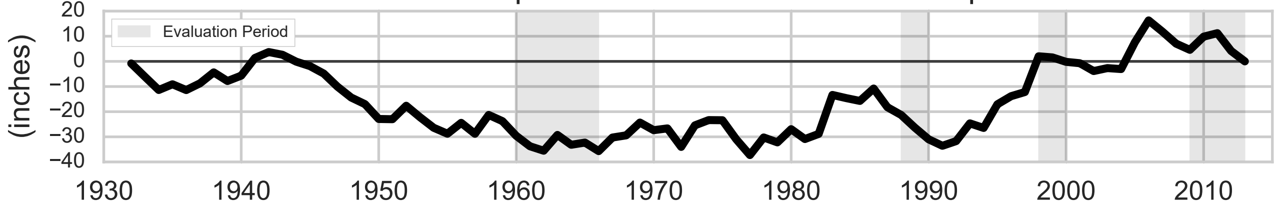

Groundwater Pumping in Stanford: RWS Area


District Activity: Treated Water Delivery

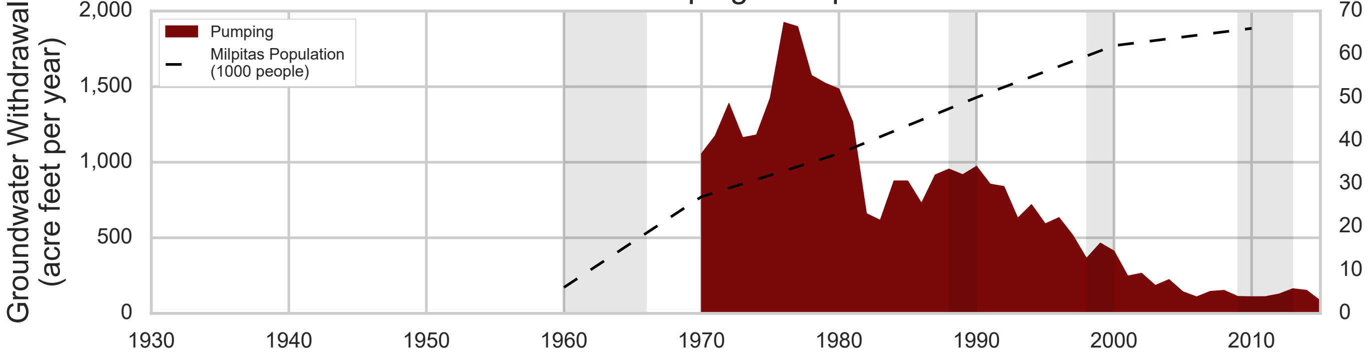

Observed Groundwater Elevations in Stanford: RWS Area

Pumping Area: Milpitas: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells

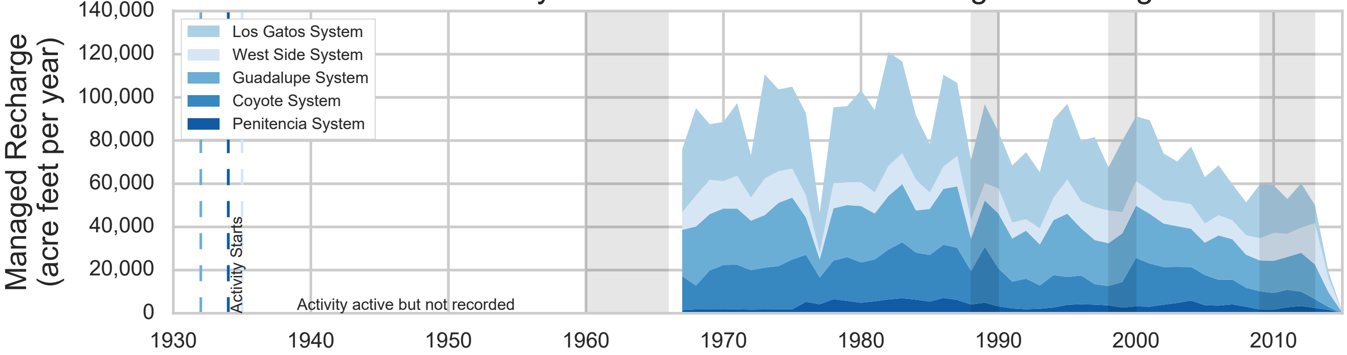
Cumulative Departure from Mean Annual Precipitation



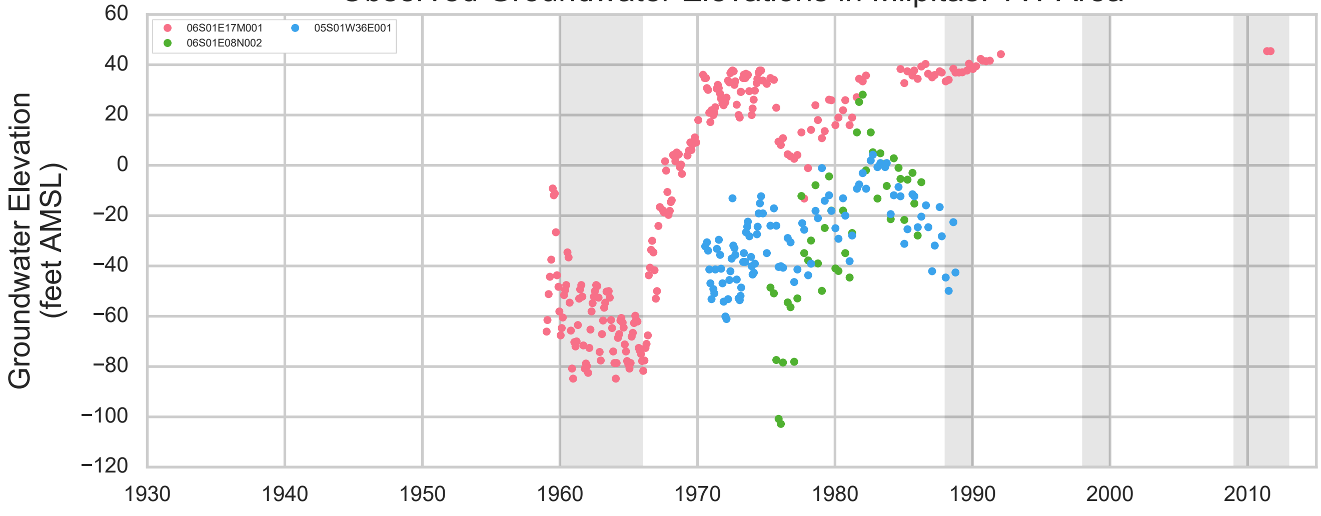
Groundwater Pumping in Milpitas: TW Area



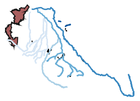
District Activity: Santa Clara Subbasin Managed Recharge



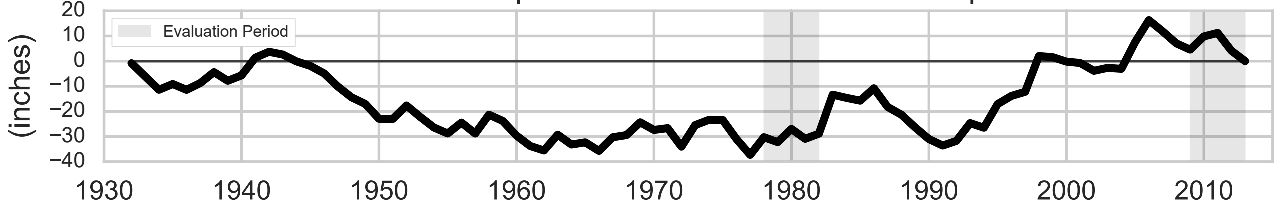
Observed Groundwater Elevations in Milpitas: TW Area



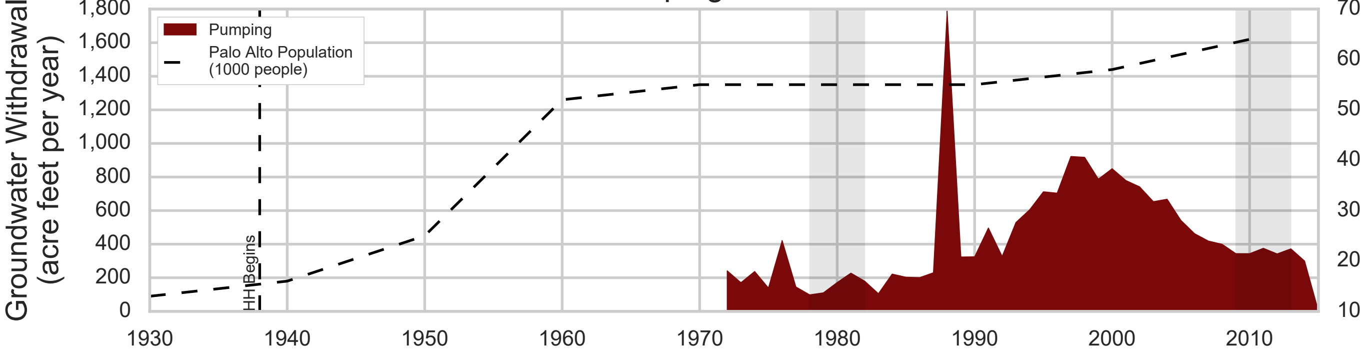
Pumping Area: Palo Alto: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells



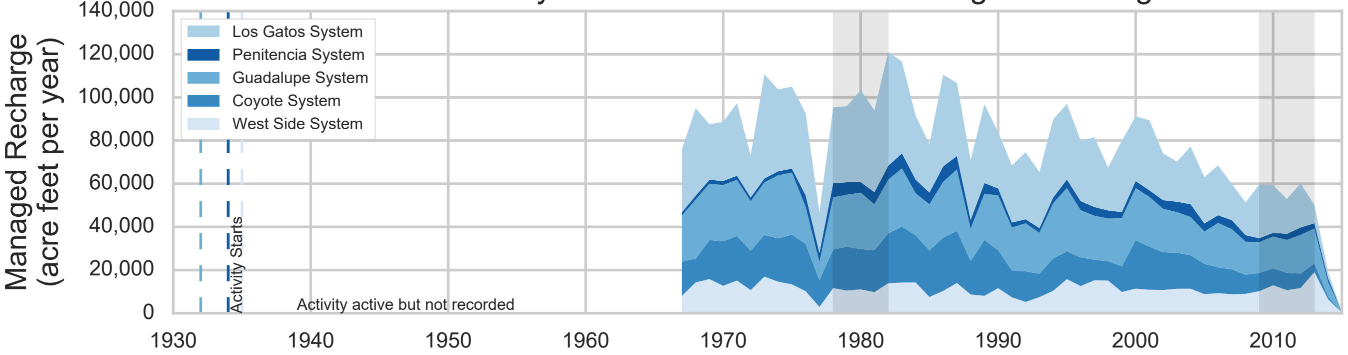
Cumulative Departure from Mean Annual Precipitation



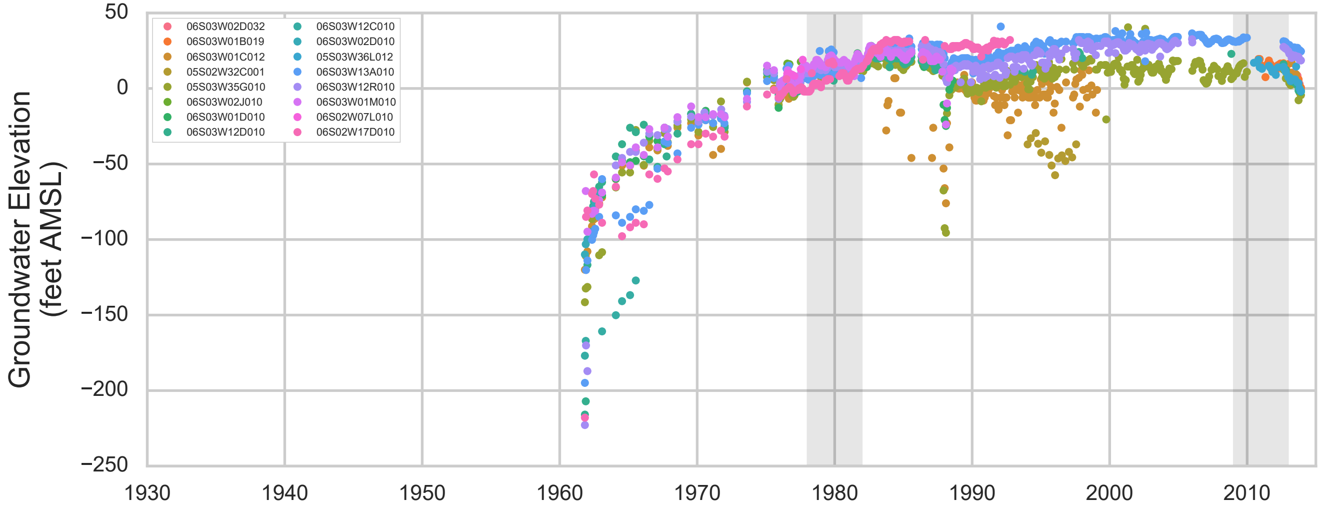
Groundwater Pumping in Palo Alto: RWS Area



District Activity: Santa Clara Subbasin Managed Recharge

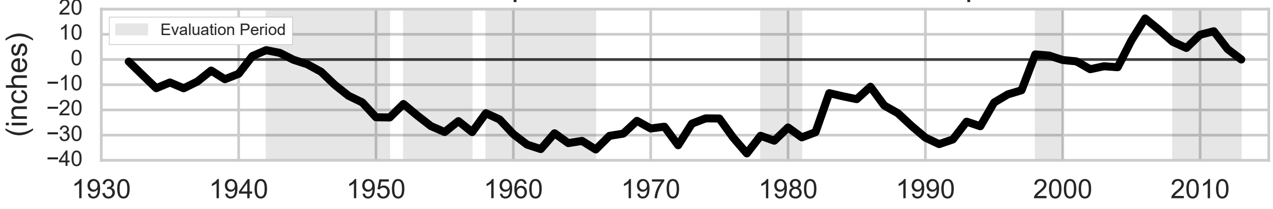


Observed Groundwater Elevations in Palo Alto: RWS Area

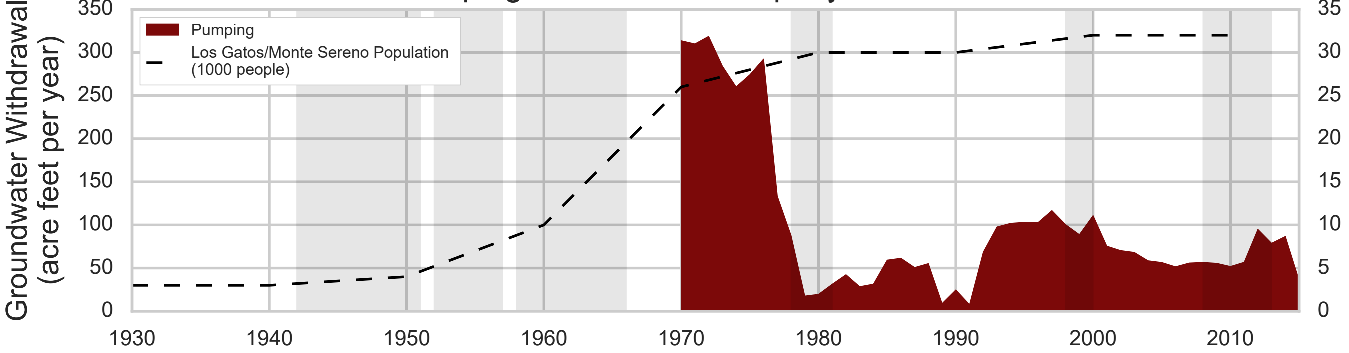


Pumping Area: SJ Water Company Los Gatos: Local SW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells

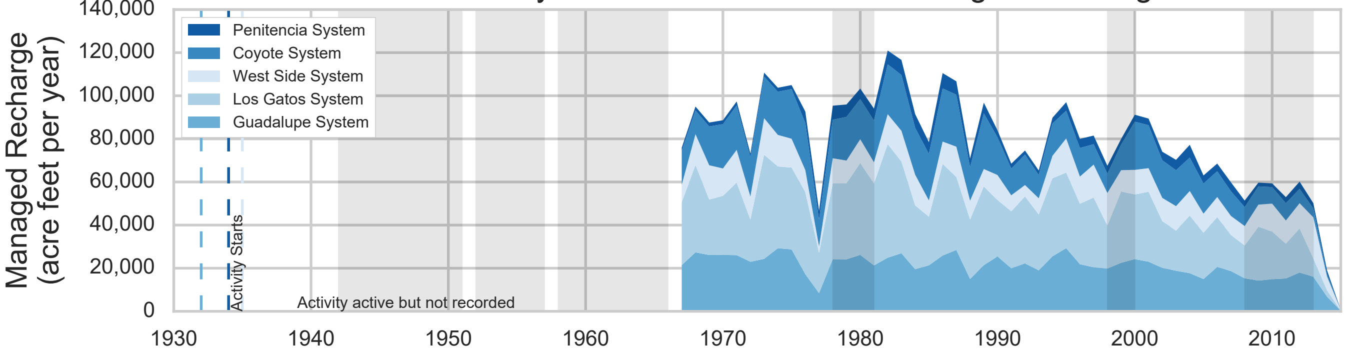
Cumulative Departure from Mean Annual Precipitation



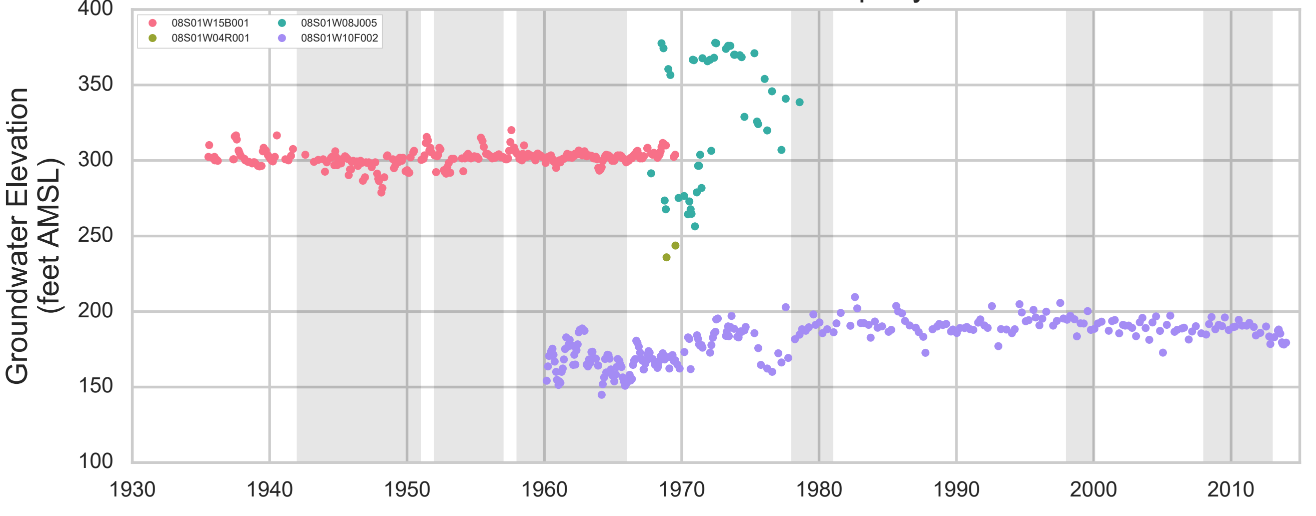
Groundwater Pumping in SJ Water Company Los Gatos: Local SW Area



District Activity: Santa Clara Subbasin Managed Recharge

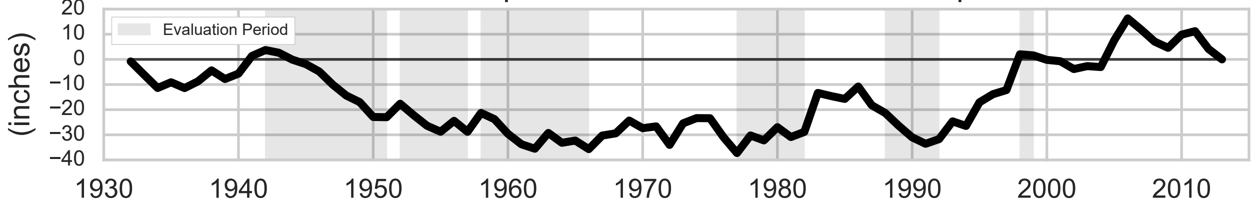


Observed Groundwater Elevations in SJ Water Company Los Gatos: Local SW Area

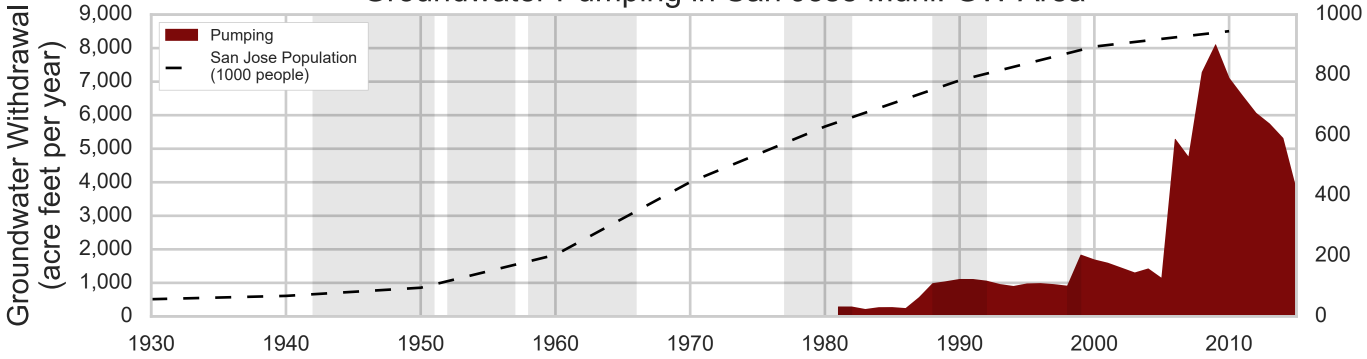


Pumping Area: San Jose Muni: GW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells

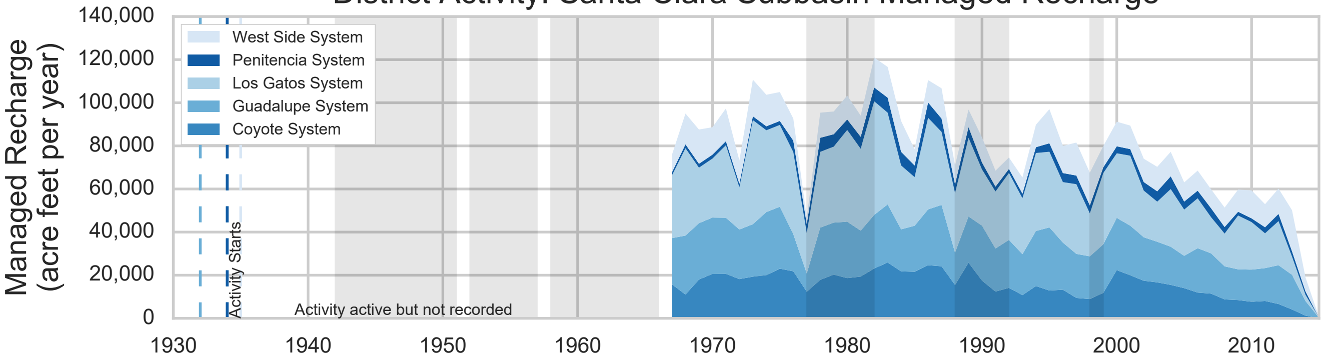
Cumulative Departure from Mean Annual Precipitation



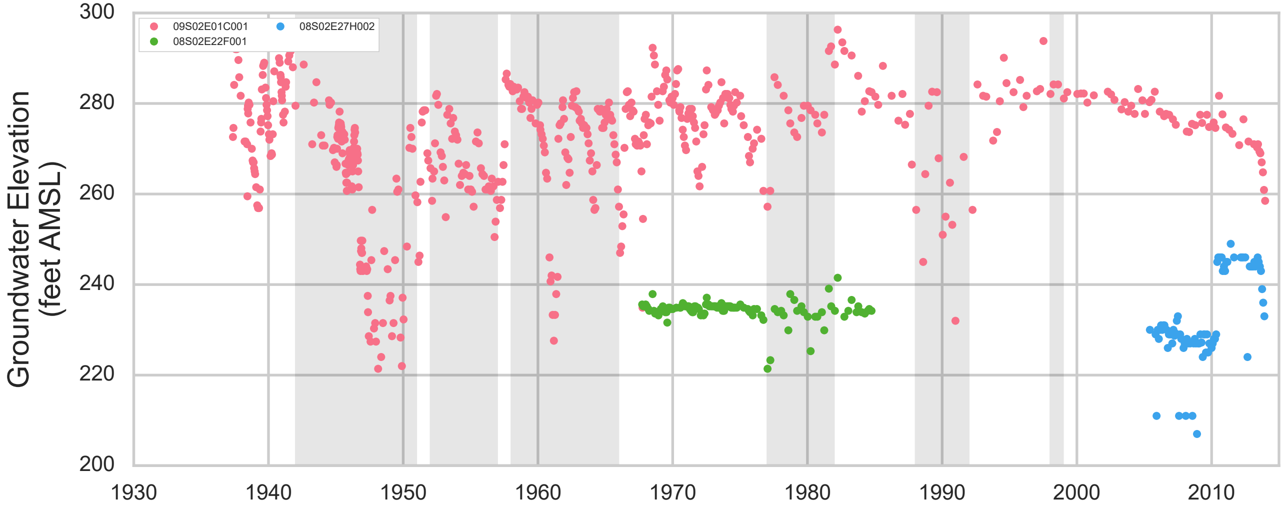
Groundwater Pumping in San Jose Muni: GW Area



District Activity: Santa Clara Subbasin Managed Recharge

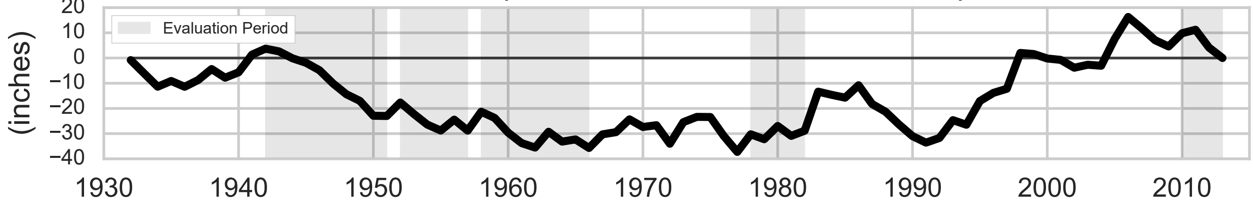


Observed Groundwater Elevations in San Jose Muni: GW Area

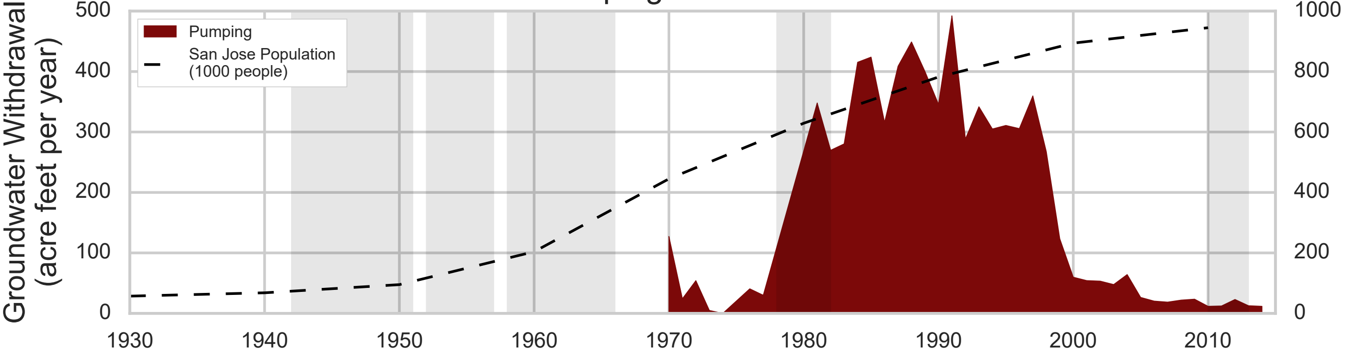


Pumping Area: San Jose Muni: TW
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells

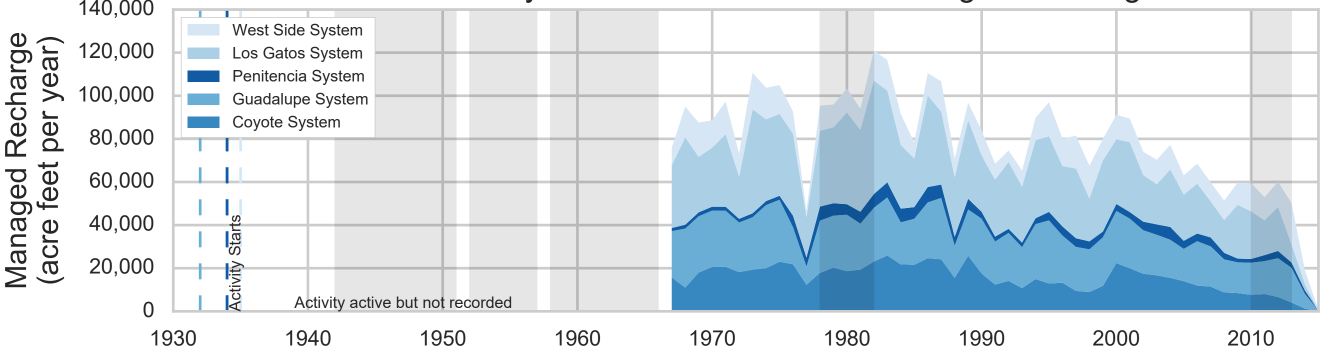
Cumulative Departure from Mean Annual Precipitation



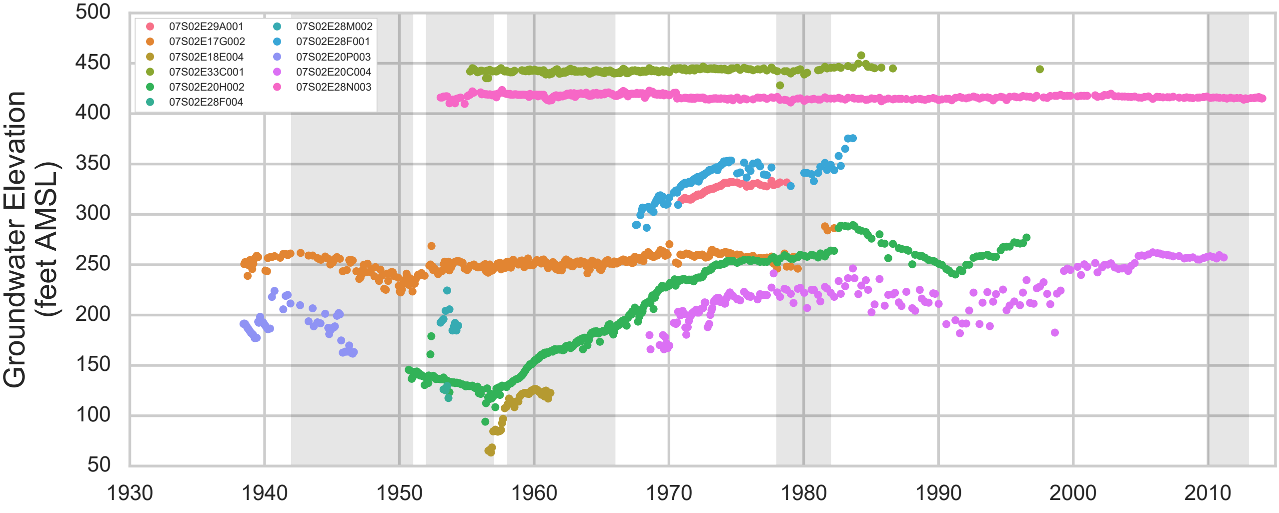
Groundwater Pumping in San Jose Muni: TW Area



District Activity: Santa Clara Subbasin Managed Recharge

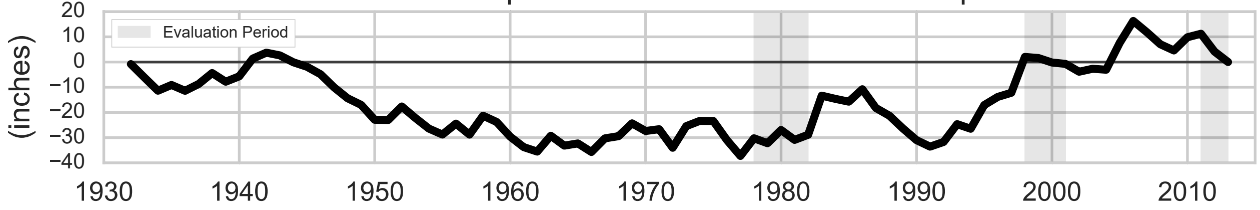


Observed Groundwater Elevations in San Jose Muni: TW Area

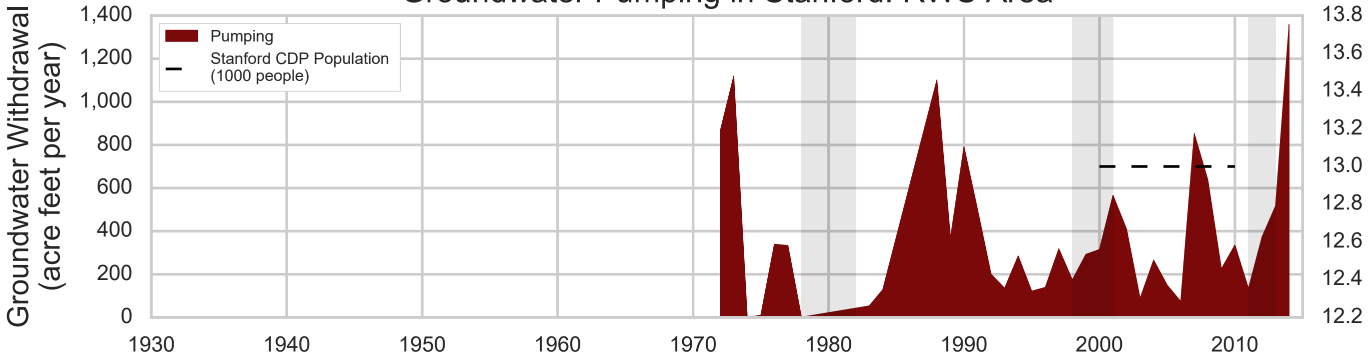


Pumping Area: Stanford: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells

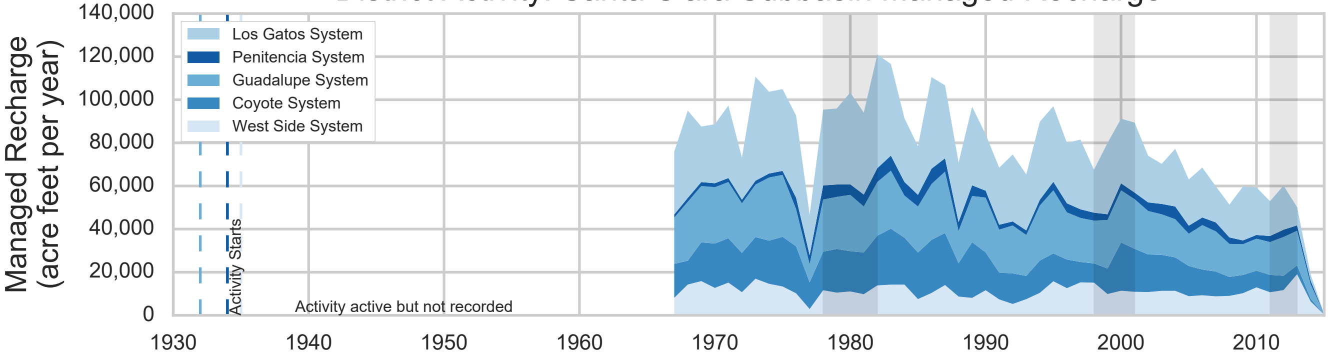
Cumulative Departure from Mean Annual Precipitation



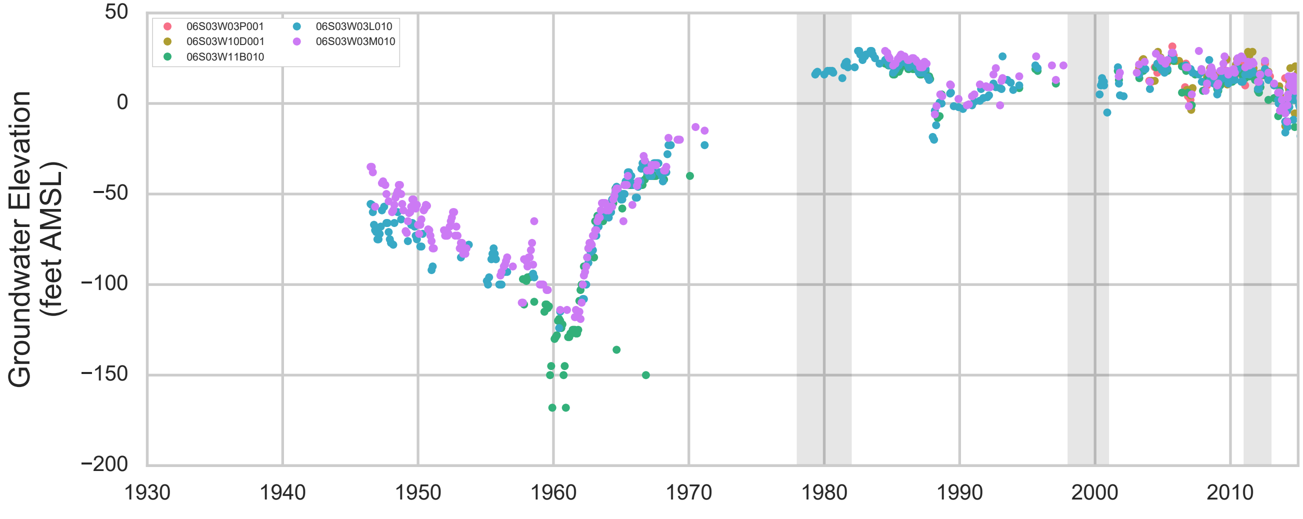
Groundwater Pumping in Stanford: RWS Area



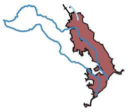
District Activity: Santa Clara Subbasin Managed Recharge

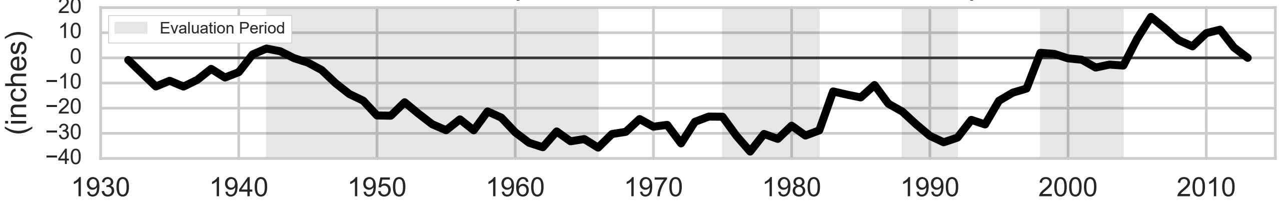


Observed Groundwater Elevations in Stanford: RWS Area

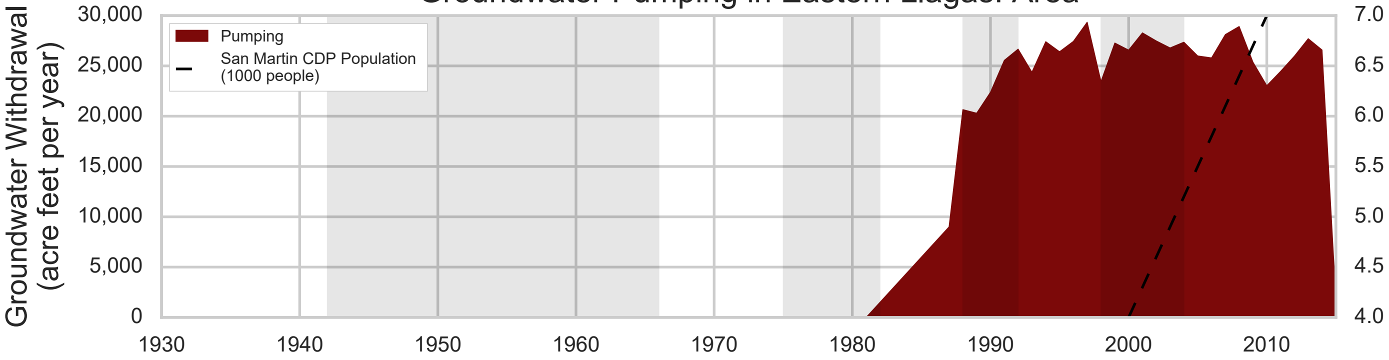


Pumping Area: Eastern Llagas:
Activity: Llagas Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells

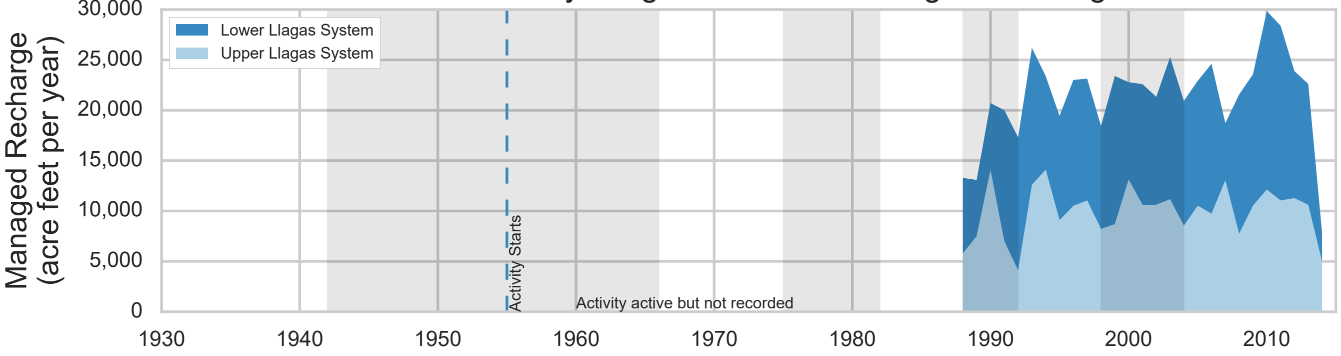




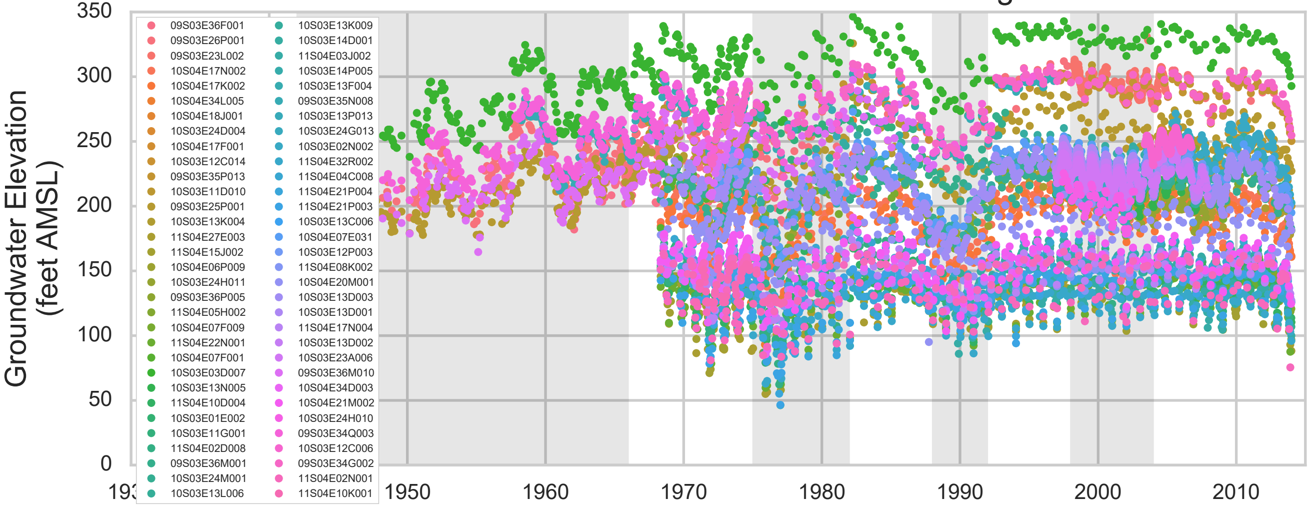
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Eastern Llagas: Area



District Activity: Llagas Subbasin Managed Recharge



Observed Groundwater Elevations in Eastern Llagas: Area

MONTGOMERY
& ASSOCIATES

Appendix G

Mann-Kendall Statistics for Groundwater Level Data

Activity	Pumping Area	Evaluation Period	Well Type	Visual Trend	Count of wells with n > 8	Average tau	Max tau	Min tau	Num tau >= 0	Average padj for tau >= 0	Num tau <0	Average padj for tau < 0
Santa Clara Subbasin Managed Recharge	Cal Water Cupertino: TW	2008-2013	Monitoring Wells	Decreasing	1	0.18	0.18	0.18	1	0.65	0	0.00
Santa Clara Subbasin Managed Recharge	Cal Water Los Altos: GW	1998-2001	Monitoring Wells	Stable	4	-0.10	0.40	-0.60	1	0.22	3	0.67
Santa Clara Subbasin Managed Recharge	Cal Water Los Altos: GW	2010-2013	Monitoring Wells	Decreasing	4	-0.01	0.08	-0.20	3	1.00	1	0.43
Santa Clara Subbasin Managed Recharge	Great Oaks: GW	2009-2013	Monitoring Wells	Decreasing	7	-0.79	-0.50	-1.00	0	0.00	7	0.39
Santa Clara Subbasin Managed Recharge	Milpitas: RWS	1988-1991	Monitoring Wells	Stable	1	1.00	1.00	1.00	1	0.30	0	0.00
Santa Clara Subbasin Managed Recharge	Milpitas: TW	2009-2013	Monitoring Wells	Stable	1	-0.28	-0.28	-0.28	0	0.00	1	0.54
Santa Clara Subbasin Managed Recharge	Morgan Hill: GW	1975-1982	Monitoring Wells	Increasing	4	-0.13	0.14	-0.40	2	0.53	2	0.58
Santa Clara Subbasin Managed Recharge	Morgan Hill: GW	1998-2001	Monitoring Wells	Decreasing	2	-0.18	-0.13	-0.23	0	0.00	2	0.51
Santa Clara Subbasin Managed Recharge	Morgan Hill: GW	2009-2013	Monitoring Wells	Decreasing	5	-0.33	-0.21	-0.43	0	0.00	5	0.40
Santa Clara Subbasin Managed Recharge	Mountain View: RWS	1988-1991	Monitoring Wells	Increasing	11	0.47	1.00	-0.33	10	0.33	1	0.46
Santa Clara Subbasin Managed Recharge	Mountain View: RWS	1998-2000	Monitoring Wells	Decreasing	1	-0.67	-0.67	-0.67	0	0.00	1	0.25
Santa Clara Subbasin Managed Recharge	Mountain View: RWS	2009-2013	Monitoring Wells	Decreasing	6	0.06	0.43	-0.38	4	0.64	2	0.63
Santa Clara Subbasin Managed Recharge	Mountain View: TW	2009-2013	Monitoring Wells	Decreasing	1	0.07	0.07	0.07	1	0.83	0	0.00
Santa Clara Subbasin Managed Recharge	North Morgan Hill:	2010-2013	Monitoring Wells	Decreasing	1	-0.73	-0.73	-0.73	0	0.00	1	0.20
Santa Clara Subbasin Managed Recharge	Palo Alto: RWS	1978-1982	Monitoring Wells	Stable	4	0.32	0.78	-0.19	3	0.20	1	0.71
Santa Clara Subbasin Managed Recharge	Palo Alto: RWS	2009-2013	Monitoring Wells	Decreasing	11	-0.32	0.21	-1.00	3	0.86	8	0.42
Santa Clara Subbasin Managed Recharge	San Jose Muni: RWS	1988-1992	Monitoring Wells	Increasing	7	0.62	1.00	0.06	7	0.38	0	0.00
Santa Clara Subbasin Managed Recharge	San Jose Muni: RWS	2010-2012	Monitoring Wells	Increasing	6	0.94	1.00	0.67	6	0.37	0	0.00
Santa Clara Subbasin Managed Recharge	San Jose Muni: TW	1978-1982	Monitoring Wells	Increasing	7	0.59	1.00	-0.38	6	0.20	1	0.18
Santa Clara Subbasin Managed Recharge	San Jose Muni: TW	2010-2013	Monitoring Wells	Stable	7	0.00	1.00	-0.78	3	0.36	4	0.56
Santa Clara Subbasin Managed Recharge	Santa Clara: GW	1978-1981	Monitoring Wells	Stable	4	-0.35	0.33	-1.00	1	0.37	3	0.33
Santa Clara Subbasin Managed Recharge	Santa Clara: GW	1999-2001	Monitoring Wells	Lacks Data	1	0.00	0.00	0.00	1	1.00	0	0.00
Santa Clara Subbasin Managed Recharge	Santa Clara: GW	2009-2013	Monitoring Wells	Decreasing	1	0.33	0.33	0.33	1	0.54	0	0.00
Santa Clara Subbasin Managed Recharge	Santa Clara: RWS	2008-2010	Monitoring Wells	Stable	1	0.00	0.00	0.00	1	1.00	0	0.00
Santa Clara Subbasin Managed Recharge	Santa Clara: RWS	2011-2013	Monitoring Wells	Stable	1	0.00	0.00	0.00	1	1.00	0	0.00
Santa Clara Subbasin Managed Recharge	Santa Clara: RWS GW	1978-1981	Monitoring Wells	Increasing	3	0.53	0.67	0.43	3	0.26	0	0.00
Santa Clara Subbasin Managed Recharge	Santa Clara: RWS GW	2011-2013	Monitoring Wells	Stable	2	-0.75	-0.67	-0.83	0	0.00	2	0.39
Santa Clara Subbasin Managed Recharge	Santa Clara: TW GW	1977-1980	Monitoring Wells	Decreasing	1	0.11	0.11	0.11	1	1.00	0	0.00
Santa Clara Subbasin Managed Recharge	Santa Clara: TW GW	2010-2012	Monitoring Wells	Increasing	4	1.00	1.00	1.00	4	0.30	0	0.00
Santa Clara Subbasin Managed Recharge	SJ Water Company East: TW	1978-1981	Monitoring Wells	Increasing	11	0.41	1.00	-0.58	10	0.44	1	0.22
Santa Clara Subbasin Managed Recharge	SJ Water Company East: TW	1998-2001	Monitoring Wells	Stable	6	-0.38	0.20	-0.90	1	0.85	5	0.41
Santa Clara Subbasin Managed Recharge	SJ Water Company East: TW	2009-2013	Monitoring Wells	Stable	6	0.15	0.47	-0.33	4	0.39	2	0.57
Santa Clara Subbasin Managed Recharge	SJ Water Company Los Gatos: Local SW	1978-1981	Monitoring Wells	Stable	1	-0.33	-0.33	-0.33	0	0.00	1	0.60
Santa Clara Subbasin Managed Recharge	SJ Water Company North: GW	1978-1981	Monitoring Wells	Increasing	17	0.22	1.00	-0.40	12	0.45	5	0.55
Santa Clara Subbasin Managed Recharge	SJ Water Company North: GW	2011-2013	Monitoring Wells	Decreasing	21	-0.64	0.50	-1.00	3	0.77	18	0.53
Santa Clara Subbasin Managed Recharge	SJ Water Company South: TW	1998-2001	Monitoring Wells	Decreasing	8	-0.57	-0.20	-0.89	0	0.00	8	0.35
Santa Clara Subbasin Managed Recharge	SJ Water Company South: TW	2008-2013	Monitoring Wells	Stable	10	0.23	0.57	-0.52	7	0.25	3	0.32
Santa Clara Subbasin Managed Recharge	SJ Water Company West: TW	1988-1992	Monitoring Wells	Stable	5	0.31	0.83	-0.33	3	0.05	2	0.68
Santa Clara Subbasin Managed Recharge	SJ Water Company West: TW	2009-2012	Monitoring Wells	Increasing	5	0.86	1.00	0.71	5	0.12	0	0.00
Santa Clara Subbasin Managed Recharge	Sunnyvale: RWS	1977-1979	Monitoring Wells	Stable	4	0.33	1.00	-0.33	2	0.37	2	1.00
Santa Clara Subbasin Managed Recharge	Sunnyvale: RWS	1988-1992	Monitoring Wells	Increasing	3	0.94	1.00	0.91	3	0.06	0	0.00
Santa Clara Subbasin Managed Recharge	Sunnyvale: RWS	2010-2012	Monitoring Wells	Stable	2	0.33	1.00	-0.33	1	0.25	1	0.82
Santa Clara Subbasin Managed Recharge	Sunnyvale: TW	1980-1982	Monitoring Wells	Stable	1	-0.33	-0.33	-0.33	0	0.00	1	1.00

Activity	Pumping Area	Evaluation Period	Well Type	Visual Trend	Count of wells with n > 8	Average tau	Max tau	Min tau	Num tau >= 0	Average padj for tau >= 0	Num tau <0	Average padj for tau < 0
Treated Water Delivery	Cal Water Los Altos: GW	1986-1988	Monitoring Wells	Stable	7	-0.52	0.00	-1.00	1	1.00	6	0.62
Treated Water Delivery	Cal Water Los Altos: GW	1998-2004	Monitoring Wells	Stable	14	-0.17	0.50	-0.62	3	0.69	11	0.38
Treated Water Delivery	Cal Water Los Altos: GW	2010-2013	Monitoring Wells	Decreasing	12	-0.10	0.20	-0.42	6	1.00	6	0.56
Treated Water Delivery	Cal Water Mountain View: GW	1980-1982	Monitoring Wells	Increasing	3	0.33	0.33	0.33	3	1.00	0	0.00
Treated Water Delivery	Cal Water Mountain View: GW	1986-1992	Monitoring Wells	Increasing	3	0.41	0.60	0.30	3	0.19	0	0.00
Treated Water Delivery	Cal Water Mountain View: GW	1998-2004	Monitoring Wells	Decreasing	3	-0.21	0.39	-0.62	1	0.53	2	0.14
Treated Water Delivery	Cal Water Mountain View: GW	2010-2013	Monitoring Wells	Stable	1	-0.08	-0.08	-0.08	0	0.00	1	1.00
Treated Water Delivery	Cal Water Sunnyvale: GW	1998-2004	Monitoring Wells	Decreasing	5	-0.36	-0.02	-0.79	0	0.00	5	0.29
Treated Water Delivery	Cal Water Sunnyvale: GW	2009-2013	Monitoring Wells	Stable	5	0.27	0.58	-0.14	4	0.20	1	0.66
Treated Water Delivery	Great Oaks: GW	1975-1982	Monitoring Wells	Stable	9	-0.37	0.21	-1.00	1	0.26	8	0.38
Treated Water Delivery	Great Oaks: GW	1998-2004	Monitoring Wells	Decreasing	4	-0.14	0.00	-0.24	1	1.00	3	0.67
Treated Water Delivery	Great Oaks: GW	2009-2013	Monitoring Wells	Decreasing	8	-0.77	-0.50	-1.00	0	0.00	8	0.36
Treated Water Delivery	Milpitas: RWS	1975-1982	Monitoring Wells	Increasing	4	-0.19	0.64	-1.00	2	0.26	2	0.25
Treated Water Delivery	Milpitas: RWS	1986-1991	Monitoring Wells	Lacks Data	1	-0.28	-0.28	-0.28	0	0.00	1	0.46
Treated Water Delivery	Morgan Hill: GW	1975-1982	Monitoring Wells	Increasing	5	0.03	0.24	-0.40	3	0.44	2	0.77
Treated Water Delivery	Morgan Hill: GW	1986-1992	Monitoring Wells	Decreasing	4	-0.29	-0.16	-0.40	0	0.00	4	0.24
Treated Water Delivery	Morgan Hill: GW	1998-2004	Monitoring Wells	Decreasing	3	-0.19	0.13	-0.48	1	0.58	2	0.17
Treated Water Delivery	Morgan Hill: GW	2009-2013	Monitoring Wells	Decreasing	7	-0.31	0.00	-0.56	1	1.00	6	0.37
Treated Water Delivery	Mountain View: RWS	1986-1991	Monitoring Wells	Increasing	11	0.01	0.60	-0.53	5	0.46	6	0.55
Treated Water Delivery	Mountain View: RWS	1998-2000	Monitoring Wells	Decreasing	2	-0.83	-0.67	-1.00	0	0.00	2	0.27
Treated Water Delivery	Mountain View: RWS	2001-2004	Monitoring Wells	Stable	4	0.43	1.00	-0.50	3	0.64	1	0.72
Treated Water Delivery	Mountain View: RWS	2009-2013	Monitoring Wells	Decreasing	7	0.04	0.43	-0.38	4	0.64	3	0.75
Treated Water Delivery	North Morgan Hill:	1986-1992	Monitoring Wells	Decreasing	2	-0.31	-0.11	-0.50	0	0.00	2	0.27
Treated Water Delivery	North Morgan Hill:	1999-2004	Monitoring Wells	Decreasing	2	-0.47	-0.31	-0.64	0	0.00	2	0.16
Treated Water Delivery	North Morgan Hill:	2010-2013	Monitoring Wells	Decreasing	3	-0.78	-0.73	-0.87	0	0.00	3	0.18
Treated Water Delivery	Palo Alto: RWS	1978-1982	Monitoring Wells	Stable	4	0.32	0.78	-0.19	3	0.20	1	0.71
Treated Water Delivery	Palo Alto: RWS	1986-1992	Monitoring Wells	Decreasing	5	-0.46	-0.13	-0.80	0	0.00	5	0.22
Treated Water Delivery	Palo Alto: RWS	2009-2013	Monitoring Wells	Decreasing	11	-0.32	0.21	-1.00	3	0.86	8	0.42
Treated Water Delivery	San Jose Muni: RWS	1986-1992	Monitoring Wells	Increasing	10	0.36	0.75	-0.33	8	0.22	2	0.41
Treated Water Delivery	San Jose Muni: RWS	2000-2003	Monitoring Wells	Lacks Data	3	0.50	1.00	0.00	3	0.48	0	0.00
Treated Water Delivery	San Jose Muni: RWS	2010-2012	Monitoring Wells	Increasing	7	0.90	1.00	0.67	7	0.35	0	0.00
Treated Water Delivery	Santa Clara: GW	1975-1982	Monitoring Wells	Stable	11	-0.12	0.21	-0.80	7	0.64	4	0.12
Treated Water Delivery	Santa Clara: GW	1999-2001	Monitoring Wells	Lacks Data	1	0.00	0.00	0.00	1	1.00	0	0.00
Treated Water Delivery	Santa Clara: GW	2009-2013	Monitoring Wells	Decreasing	1	0.33	0.33	0.33	1	0.54	0	0.00
Treated Water Delivery	Santa Clara: RWS	2011-2013	Monitoring Wells	Lacks Data	1	0.00	0.00	0.00	1	1.00	0	0.00
Treated Water Delivery	Santa Clara: RWS GW	1975-1981	Monitoring Wells	Increasing	6	-0.13	0.31	-0.50	3	0.55	3	0.54
Treated Water Delivery	Santa Clara: RWS GW	2011-2013	Monitoring Wells	Stable	2	-0.75	-0.67	-0.83	0	0.00	2	0.39
Treated Water Delivery	SJ Water Company Los Gatos: Local SW	1979-1982	Monitoring Wells	Stable	2	-0.02	0.11	-0.14	1	1.00	1	1.00
Treated Water Delivery	SJ Water Company Los Gatos: Local SW	1998-2000	Monitoring Wells	Decreasing	1	-1.00	-1.00	-1.00	0	0.00	1	0.30
Treated Water Delivery	SJ Water Company Los Gatos: Local SW	2001-2004	Monitoring Wells	Decreasing	1	-0.13	-0.13	-0.13	0	0.00	1	1.00
Treated Water Delivery	SJ Water Company Los Gatos: Local SW	2009-2013	Monitoring Wells	Decreasing	1	-0.53	-0.53	-0.53	0	0.00	1	0.22
Treated Water Delivery	SJ Water Company North: GW	1975-1982	Monitoring Wells	Increasing	31	0.04	0.46	-0.83	20	0.48	11	0.45
Treated Water Delivery	SJ Water Company North: GW	2011-2013	Monitoring Wells	Decreasing	23	-0.65	0.50	-1.00	3	0.77	20	0.53
Treated Water Delivery	Sunnyvale: RWS	1987-1992	Monitoring Wells	Increasing	3	0.85	0.89	0.78	3	0.03	0	0.00
Treated Water Delivery	Sunnyvale: RWS	2010-2012	Monitoring Wells	Increasing	2	0.33	1.00	-0.33	1	0.25	1	0.82
Llagas Subbasin Managed Recharge	Eastern Llagas:	1975-1982	Monitoring Wells	Increasing	3	0.45	0.54	0.34	3	0.09	0	0.00
Llagas Subbasin Managed Recharge	Eastern Llagas:	1988-1992	Monitoring Wells	Decreasing	3	0.13	0.56	-0.50	2	0.35	1	0.58
Llagas Subbasin Managed Recharge	Eastern Llagas:	1998-2004	Monitoring Wells	Stable	28	-0.15	0.33	-0.74	10	0.99	18	0.38
Llagas Subbasin Managed Recharge	Gilroy: GW	1975-1982	Monitoring Wells	Increasing	3	0.05	0.45	-0.50	2	0.32	1	0.43
Llagas Subbasin Managed Recharge	Gilroy: GW	1998-2004	Monitoring Wells	Decreasing	1	-0.50	-0.50	-0.50	0	0.00	1	0.06
Llagas Subbasin Managed Recharge	Gilroy: GW	2006-2010	Monitoring Wells	Stable	3	-0.02	0.29	-0.21	1	0.40	2	0.71
Llagas Subbasin Managed Recharge	Morgan Hill: GW	1975-1982	Monitoring Wells	Increasing	2	-0.13	0.14	-0.40	1	0.53	1	0.58
Llagas Subbasin Managed Recharge	Morgan Hill: GW	1998-2004	Monitoring Wells	Decreasing	1	-0.23	-0.23	-0.23	0	0.00	1	0.24

Activity	Pumping Area	Evaluation Period	Well Type	Visual Trend	Count of wells with n > 8	Average tau	Max tau	Min tau	Num tau >= 0	Average padj for tau >= 0	Num tau <0	Average padj for tau < 0
Santa Clara Subbasin Managed Recharge	Great Oaks: GW	1998-2001	Monitored Pumping Wells	Decreasing	16	-0.20	0.60	-1.00	7	0.65	9	0.37
Santa Clara Subbasin Managed Recharge	Milpitas: RWS	1988-1991	Monitored Pumping Wells	Increasing	1	0.83	0.83	0.83	1	0.10	0	0.00
Santa Clara Subbasin Managed Recharge	Morgan Hill: GW	1975-1982	Monitored Pumping Wells	Increasing	2	0.35	0.35	0.35	2	0.12	0	0.00
Santa Clara Subbasin Managed Recharge	Morgan Hill: GW	1998-2001	Monitored Pumping Wells	Decreasing	21	-0.07	0.67	-0.55	9	0.78	12	0.49
Santa Clara Subbasin Managed Recharge	Mountain View: RWS	1998-2000	Monitored Pumping Wells	Decreasing	3	-0.61	-0.33	-1.00	0	0.00	3	0.72
Santa Clara Subbasin Managed Recharge	Mountain View: TW	1998-2001	Monitored Pumping Wells	Decreasing	2	-0.57	-0.40	-0.73	0	0.00	0	0.35
Santa Clara Subbasin Managed Recharge	North Morgan Hill:	1978-1982	Monitored Pumping Wells	Increasing	2	-0.27	-0.11	-0.43	0	0.00	2	0.44
Santa Clara Subbasin Managed Recharge	North Morgan Hill:	1999-2001	Monitored Pumping Wells	Decreasing	5	0.07	0.33	-0.33	4	1.00	1	1.00
Santa Clara Subbasin Managed Recharge	Palo Alto: RWS	1978-1982	Monitored Pumping Wells	Increasing	8	0.62	0.76	0.40	8	0.10	0	0.00
Santa Clara Subbasin Managed Recharge	Palo Alto: RWS	2009-2013	Monitored Pumping Wells	Decreasing	4	-0.96	-0.86	-1.00	0	0.00	4	0.40
Santa Clara Subbasin Managed Recharge	San Jose Muni: GW	1977-1982	Monitored Pumping Wells	Increasing	1	0.12	0.12	0.12	1	0.70	0	0.00
Santa Clara Subbasin Managed Recharge	San Jose Muni: TW	1978-1982	Monitored Pumping Wells	Stable	2	0.33	0.83	-0.17	1	0.20	1	0.72
Santa Clara Subbasin Managed Recharge	Santa Clara: GW	1978-1981	Monitored Pumping Wells	Stable	9	0.37	0.71	-0.11	8	0.55	1	1.00
Santa Clara Subbasin Managed Recharge	Santa Clara: GW	1999-2001	Monitored Pumping Wells	Decreasing	13	-0.33	0.67	-1.00	4	0.74	9	0.50
Santa Clara Subbasin Managed Recharge	Santa Clara: RWS GW	1978-1981	Monitored Pumping Wells	Stable	2	0.55	0.60	0.50	2	0.46	0	0.00
Santa Clara Subbasin Managed Recharge	Santa Clara: RWS GW	1998-2004	Monitored Pumping Wells	Lacks Data	1	-0.70	-0.70	-0.70	0	0.00	1	0.20
Santa Clara Subbasin Managed Recharge	Santa Clara: TW GW	1977-1980	Monitored Pumping Wells	Stable	7	0.23	0.40	0.00	7	0.65	0	0.00
Santa Clara Subbasin Managed Recharge	SJ Water Company East: TW	1978-1981	Monitored Pumping Wells	Increasing	11	0.27	1.00	-0.80	9	0.53	2	0.11
Santa Clara Subbasin Managed Recharge	SJ Water Company East: TW	1998-2001	Monitored Pumping Wells	Stable	10	-0.32	0.60	-1.00	3	0.54	7	0.28
Santa Clara Subbasin Managed Recharge	SJ Water Company North: GW	1978-1981	Monitored Pumping Wells	Increasing	11	0.17	1.00	-0.67	8	0.70	3	0.45
Santa Clara Subbasin Managed Recharge	Stanford: RWS	1978-1982	Monitored Pumping Wells	Increasing	1	1.00	1.00	1.00	1	0.25	0	0.00
Santa Clara Subbasin Managed Recharge	Stanford: RWS	2011-2013	Monitored Pumping Wells	Decreasing	4	-0.50	-0.33	-1.00	0	0.00	0	0.88

Activity	Pumping Area	Evaluation Period	Well Type	Visual Trend	Count of wells with n > 8	Average tau	Max tau	Min tau	Num tau >= 0	Average padj for tau >= 0	Num tau <0	Average padj for tau < 0
Treated Water Delivery	Great Oaks: GW	1975-1982	Monitored Pumping Wells	Stable	13	-0.18	0.45	-1.00	6	0.48	7	0.26
Treated Water Delivery	Great Oaks: GW	1998-2004	Monitored Pumping Wells	Decreasing	19	-0.29	0.60	-1.00	5	0.64	14	0.30
Treated Water Delivery	Great Oaks: GW	2009-2013	Monitored Pumping Wells	Decreasing	13	-0.21	0.44	-0.79	3	0.34	0	0.40
Treated Water Delivery	Milpitas: RWS	1975-1982	Monitored Pumping Wells	Increasing	3	-0.16	0.38	-0.58	1	0.11	2	0.19
Treated Water Delivery	Milpitas: RWS	1986-1991	Monitored Pumping Wells	Increasing	1	0.54	0.54	0.54	1	0.13	0	0.00
Treated Water Delivery	Morgan Hill: GW	1975-1982	Monitored Pumping Wells	Increasing	6	0.25	0.41	-0.02	5	0.22	1	0.95
Treated Water Delivery	Morgan Hill: GW	1986-1992	Monitored Pumping Wells	Decreasing	5	-0.31	-0.16	-0.38	0	0.00	5	0.29
Treated Water Delivery	Morgan Hill: GW	1998-2004	Monitored Pumping Wells	Decreasing	16	-0.28	0.33	-0.59	2	0.84	14	0.36
Treated Water Delivery	Morgan Hill: GW	2009-2013	Monitored Pumping Wells	Decreasing	2	0.23	0.67	-0.21	1	0.06	0	0.56
Treated Water Delivery	Mountain View: RWS	1986-1991	Monitored Pumping Wells	Increasing	5	-0.10	0.48	-0.81	2	0.29	3	0.51
Treated Water Delivery	Mountain View: RWS	1998-2000	Monitored Pumping Wells	Decreasing	3	-0.61	-0.33	-1.00	0	0.00	3	0.72
Treated Water Delivery	Mountain View: RWS	2001-2004	Monitored Pumping Wells	Stable	3	-0.47	0.20	-1.00	1	0.67	2	0.34
Treated Water Delivery	Mountain View: RWS	2009-2013	Monitored Pumping Wells	Decreasing	5	0.16	0.67	-0.33	3	0.35	1	0.81
Treated Water Delivery	North Morgan Hill:	1986-1992	Monitored Pumping Wells	Decreasing	7	-0.56	-0.02	-0.70	0	0.00	7	0.17
Treated Water Delivery	North Morgan Hill:	1999-2004	Monitored Pumping Wells	Decreasing	9	-0.46	0.00	-0.72	1	1.00	8	0.16
Treated Water Delivery	North Morgan Hill:	2010-2013	Monitored Pumping Wells	Decreasing	6	-0.43	-0.25	-0.60	0	0.00	0	0.47
Treated Water Delivery	Palo Alto: RWS	1978-1982	Monitored Pumping Wells	Increasing	8	0.62	0.76	0.40	8	0.10	0	0.00
Treated Water Delivery	Palo Alto: RWS	1986-1992	Monitored Pumping Wells	Decreasing	7	-0.58	0.21	-1.00	1	0.58	6	0.26
Treated Water Delivery	Palo Alto: RWS	2009-2013	Monitored Pumping Wells	Decreasing	4	-0.96	-0.86	-1.00	0	0.00	0	0.40
Treated Water Delivery	San Jose Muni: GW	1975-1982	Monitored Pumping Wells	Increasing	2	0.07	0.27	-0.14	1	0.23	0	0.50
Treated Water Delivery	San Jose Muni: GW	1986-1992	Monitored Pumping Wells	Decreasing	1	-0.55	-0.55	-0.55	0	0.00	0	0.12
Treated Water Delivery	San Jose Muni: RWS	1986-1992	Monitored Pumping Wells	Increasing	12	0.42	0.91	-1.00	9	0.12	1	0.43
Treated Water Delivery	San Jose Muni: RWS	2000-2003	Monitored Pumping Wells	Decreasing	2	0.67	0.67	0.67	2	0.25	0	0.00
Treated Water Delivery	San Jose Muni: RWS	2010-2012	Monitored Pumping Wells	Increasing	3	0.33	1.00	-1.00	2	0.38	0	0.62
Treated Water Delivery	Santa Clara: GW	1975-1982	Monitored Pumping Wells	Stable	13	-0.03	0.44	-0.56	5	0.50	8	0.52
Treated Water Delivery	Santa Clara: GW	1999-2001	Monitored Pumping Wells	Decreasing	14	-0.33	0.67	-1.00	4	0.74	0	0.55
Treated Water Delivery	Santa Clara: GW	2009-2013	Monitored Pumping Wells	Decreasing	18	0.26	0.67	-0.17	17	0.53	0	0.67
Treated Water Delivery	Santa Clara: RWS GW	1975-1981	Monitored Pumping Wells	Increasing	2	0.08	0.16	0.00	2	0.78	0	0.00
Treated Water Delivery	Santa Clara: RWS GW	1998-2004	Monitored Pumping Wells	Lacks Data	1	-0.70	-0.70	-0.70	0	0.00	1	0.20
Treated Water Delivery	Santa Clara: RWS GW	2011-2013	Monitored Pumping Wells	Decreasing	1	-0.33	-0.33	-0.33	0	0.00	0	0.82
Treated Water Delivery	SJ Water Company Los Gatos: Local SW	1979-1982	Monitored Pumping Wells	Stable	1	-0.14	-0.14	-0.14	0	0.00	1	1.00
Treated Water Delivery	SJ Water Company Los Gatos: Local SW	1998-2000	Monitored Pumping Wells	Decreasing	1	-1.00	-1.00	-1.00	0	0.00	1	0.30
Treated Water Delivery	SJ Water Company Los Gatos: Local SW	2001-2004	Monitored Pumping Wells	Decreasing	1	-0.33	-0.33	-0.33	0	0.00	1	0.54
Treated Water Delivery	SJ Water Company Los Gatos: Local SW	2009-2013	Monitored Pumping Wells	Decreasing	1	-0.47	-0.47	-0.47	0	0.00	0	0.32
Treated Water Delivery	SJ Water Company North: GW	1975-1982	Monitored Pumping Wells	Increasing	26	0.13	0.59	-1.00	21	0.25	5	0.48
Treated Water Delivery	SJ Water Company North: GW	2011-2013	Monitored Pumping Wells	Decreasing	3	-0.89	-0.67	-1.00	0	0.00	0	0.46
Treated Water Delivery	Stanford: RWS	1978-1982	Monitored Pumping Wells	Increasing	1	1.00	1.00	1.00	1	0.25	0	0.00
Treated Water Delivery	Stanford: RWS	1998-2001	Monitored Pumping Wells	Lacks Data	1	1.00	1.00	1.00	1	0.19	0	0.00
Treated Water Delivery	Stanford: RWS	2011-2013	Monitored Pumping Wells	Decreasing	4	-0.50	-0.33	-1.00	0	0.00	0	0.88
Llagas Subbasin Managed Recharge	Eastern Llagas:	1975-1982	Monitored Pumping Wells	Increasing	26	0.33	0.56	-0.50	24	0.17	2	0.64
Llagas Subbasin Managed Recharge	Eastern Llagas:	1988-1992	Monitored Pumping Wells	Decreasing	26	-0.13	0.47	-0.79	12	0.65	14	0.39
Llagas Subbasin Managed Recharge	Eastern Llagas:	1998-2004	Monitored Pumping Wells	Decreasing	41	-0.52	0.00	-1.00	1	1.00	0	0.13
Llagas Subbasin Managed Recharge	Gilroy: GW	1975-1982	Monitored Pumping Wells	Increasing	5	0.36	0.45	0.27	5	0.15	0	0.00
Llagas Subbasin Managed Recharge	Gilroy: GW	1998-2004	Monitored Pumping Wells	Decreasing	1	-0.65	-0.65	-0.65	0	0.00	40	0.03
Llagas Subbasin Managed Recharge	Gilroy: GW	2006-2010	Monitored Pumping Wells	Decreasing	2	-0.17	-0.13	-0.21	0	0.00	0	0.77
Llagas Subbasin Managed Recharge	Morgan Hill: GW	1975-1982	Monitored Pumping Wells	Increasing	1	0.35	0.35	0.35	1	0.12	0	0.00
Llagas Subbasin Managed Recharge	Morgan Hill: GW	1998-2004	Monitored Pumping Wells	Decreasing	12	-0.26	0.33	-0.55	2	0.84	10	0.39

MONTGOMERY
& ASSOCIATES

Appendix H

Santa Clara Plain Groundwater Model Simulations Memo

Santa Clara Valley
Water District

MEMORANDUM

TO: George Cook

FROM: Yaping Liu
Xiaoyong Zhan

SUBJECT: Santa Clara Plain Groundwater Modeling
For the Zone of Benefit Study

DATE: August 5, 2016

The purpose of this memo is to summarize Santa Clara Plain groundwater model simulations performed for the Zone of Benefit study. Current Santa Clara Plain groundwater flow model is used to simulate groundwater conditions for six scenarios. The simulation period is from January 1970 to December 2015 with a monthly stress period for all scenarios. Table 1 summarizes modeling assumptions, input data, and the name of model output head files for each scenario. The simulation assumptions in Table 1 are only assumptions that are different from the baseline. The quantified differences are listed in Table 2. In addition, shapefiles that are related to modeling assumptions are saved in G:\GWMU_Projects\GW_Charge_Zone\ModelingResults\SantaClaraPlain\Shapefile.

Table 1. Modeling Summary

Scenario	Activity	Simulation Assumption	Output Head File
1	Baseline	➢ Pumping input data: actual data. ➢ Managed recharge input data: actual data. ➢ Treated water input data: actual data. ➢ Recycled water input data: actual data.	Scenario_1.hed
2	Treated water reduction	➢ Pumping input data: • Actual data from Jan. 1970 to Dec. 2015. • Additional pumping equal to one half of actual treated water of the same month in selected wells of retailers who received treated water from Jan. 1980 to Dec. 2015. ➢ Treated water input data: • Reduced treated water equal to one half of actual treated water volume of the same month from Jan. 1980 to Dec. 2015.	Scenario_2.hed
3	Managed recharge reduction 1	➢ Managed recharge input data: • Actual data from Jan. 1970 to Dec. 2004. • Actual import water data only (zero local water) from Jan. 2005 to Dec. 2015.	Scenario_3.hed
4	Managed recharge reduction 2	➢ Managed recharge input data: • Actual data from Jan. 1970 to Dec. 2004. • Actual local water data only (zero import water) from Jan. 2005 to Dec. 2015.	Scenario_4.hed
5	Managed recharge reduction 3	➢ Managed recharge input data: • Actual data from Jan. 1970 to Dec. 2004. • Zero from Jan. 2005 to Dec. 2015.	Scenario_5.hed
6	Recycled water reduction	➢ Pumping input data: • Actual data from Jan. 1970 to Dec. 2015. • Additional pumping equal to actual recycled water of the same month in Palo Alto system from selected retailer wells in Palo Alto area from Jan. 2000 to Dec. 2015. • Additional pumping equal to actual	Scenario_6.hed

		recycled water of the same month in Sunnyvale system from selected retailer wells in Sunnyvale area from Jan. 2000 to Dec. 2015. • Additional pumping equal to actual recycled water of the same month in South Bay Water Recycling (SBWR) from selected retailer wells in other Santa Clara Plain area ➢ Recycled input data: • Actual from Jan. 1970 to Dec. 1999. • Zero from Jan. 2000 to Dec. 2015.	

Table 2. Partial Input Data.

Scenario	2	3	4	5	6		
	Additional Pumping equal to 50% Treated Water Reduction	Managed Recharge Reduction 1	Managed Recharge Reduction 2	Managed Recharge Reduction 3	Additional Pumping equal to 100% Recycled Water Reduction from Jan. 2000 – Dec. 2015		
Year	From Jan. 1980 – Dec. 2015	Import Water Only	Local Water Only	Zero	Palo Alto Area	Sunnyvale Area	Other San Clara Plain Area
1980	36,139						
1981	35,341						
1982	33,569						
1983	36,410						
1984	39,920						
1985	40,103						
1986	40,190						
1987	46,896						
1988	52,527						
1989	59,623						
1990	52,596						
1991	48,575						
1992	46,822						
1993	50,968						
1994	51,289						
1995	53,414						
1996	60,270						
1997	66,178						
1998	61,016						
1999	65,409						
2000	64,843				64	317	4,842
2001	67,087				64	1,320	6,002
2002	71,884				76	1,347	6,355
2003	65,297				87	1,822	6,297
2004	67,314				263	1,844	7,191
2005	66,967	16,297	50,856	0	1,306	1,851	8,035
2006	65,811	18,043	50,983	0	1,549	1,928	8,734
2007	65,709	51,489	9,865	0	1,436	1,874	10,084
2008	62,524	35,111	19,439	0	1,513	1,230	10,321
2009	55,378	40,414	25,666	0	1,849	1,454	9,901
2010	54,099	22,609	35,934	0	2,827	1,518	8,612
2011	61,160	14,861	39,960	0	2,960	1,057	9,085
2012	68,174	35,532	20,410	0	3,075	640	11,586
2013	63,390	46,104	17,717	0	2,523	658	15,296
2014	45,751	4,973	5,976	0	3,243	947	20,345
2015	47,247	23,155	5,003	0	3,296	967	18,461

Appendix I

Llagas Groundwater Model Simulations Memo

Santa Clara Valley Water District

MEMORANDUM

TO: George Cook, Vanessa De La Piedra

FROM: Chanie Abuye

SUBJECT: Llagas subbasin modeling results for Groundwater Charge ZOB study

DATE: July 29, 2016

The purpose of this memorandum is to document the modeling assumptions and data used to run the Llagas groundwater flow model to support the groundwater charge zone of benefit (ZOB) study. Existing Llagas groundwater flow model is used to assess the subbasin groundwater condition using actual groundwater pumping and recharge data from the beginning of October 1987 to the end of 2015 in one month increments. The groundwater demands and recharge conditions are based on the asumptions provided in the attached excel sheet, which are also listed below.

Assumptions, Scenarios and Results

Using the modeling assumptions described in detail below, a total of five different model runs were performed to produce the model output and the model outputs in MODFLOW binary head file format are presented as follows:

Scenarios	Assumptions	Outputs or Results
Baseline	➢ Simulation period: Oct87 to Dec15 ➢ Actual groundwater pumping ➢ Actual recharge (managed and natural)	Baseline.hds
Scenario1: Eliminate local water managed recharge	➢ Simulation period: Oct87 to Dec15 ➢ Actual groundwater pumping ➢ Actual recharge (managed and natural): **Oct87 to Dec04** ➢ **Eliminate local water managed recharge: Jan05 to Dec15**	EliminateLocalWaterManagedRecharge.hds
Scenario2: Eliminate upper Llagas imported water managed recharge	➢ Simulation period: Oct87 to Dec15 ➢ Actual groundwater pumping ➢ Actual recharge (managed and natural): **Oct87 to Dec04** ➢ **Eliminate Upper Llagas imported water managed recharge: Jan05 to Dec15**	EliminateImportedWaterManagedRecharge.hds
Scenario3: Eliminate all managed recharge	➢ Simulation period: Oct87 to Dec15 ➢ Actual groundwater pumping ➢ Actual recharge (managed and natural): **Oct87 to Dec04** ➢ **Eliminate all managed recharge: Jan05 to Dec15**	EliminateAllManagedRecharge.hds
Scenario4: Increased groundwater pumping by	➢ Simulation period: Oct87 to Dec15 ➢ Actual recharge (managed and natural) ➢ Actual groundwater pumping: **Oct87 to Dec98**	IncreasedGWPumpingByAmountsOfRWDelivery.hds

amounts of recycled water (RW) delivery	➢ **Increased groundwater pumping by the amounts of monthly recycled water delivery: Jan99 to Dec15. A total of 58 groundwater pumping wells (Ag and MI) within half mile distance of the recycled water pipeline are used to distribute increased pumping evenly. 58 wells are selected from 2015 groundwater pumping distribution.**	

For reference purpose, measured and simulated groundwater hydrographs from model layer 1 for San Martin well are included in the attachment. The hydrographs are generated to confirm the model assumptions input data are reasonably applied into the model for the intended simulation period. A location map is also included in the attachment to provide the approximate location of recycled water pipeline, half mile buffer outline, instream recharge, percolation ponds, groundwater extraction wells and San Martin groundwater monitoring well in Llagas Subbasin.

Please let me know if you have any questions or comments regarding this memo or the attached files.

Attachments:

1. Baseline.hds
2. EliminateLocalWaterManagedRecharge.hds
3. EliminateImportedWaterManagedRecharge.hds
4. EliminateAllManagedRecharge.hds
5. IncreasedGWPumpingByAmountsOfRWDelivery.hds
6. LlagasSanMartinWellHydrographs
7. Location map of recycled water pipeline and other reference features in Llagas Subbasin

1. Baseline

Calendar Year	All managed recharge water in baseline model, AF	
2005	22,920	
2006	24,614	
2007	18,719	
2008	21,572	
2009	23,574	
2010	29,845	
2011	28,393	
2012	23,883	
2013	22,622	
2014	7,855	
2015	19,311	

Scenario 1. Eliminate Llagas local managed recharge

Calendar Year	Managed recharge water applied in the model, AF	Eliminated Llagas local managed recharge, AF
2005	9,820	13,100
2006	6,621	17,993
2007	12,736	5,983
2008	11,531	10,041
2009	9,668	13,906
2010	9,548	20,297
2011	7,672	20,721
2012	11,158	12,725
2013	11,601	11,022
2014	5,328	2,528
2015	10,713	8,599

Scenario 2. Eliminate Upper Llagas imported water managed recharge

CY	Managed recharge water applied in the model, AF	Eliminated Upper Llagas imported water managed recharge, AF
2005	18,408	4,512
2006	21,993	2,621
2007	9,844	8,875
2008	17,436	4,136
2009	19,254	4,320
2010	25,964	3,881
2011	25,410	2,983
2012	18,614	5,269
2013	17,179	5,443
2014	4,476	3,380
2015	13,612	5,699

Scenario 3. Eliminate all managed recharge

Calendar Year	Managed recharge water applied in the model, AF	Eliminated All Managed recharge Water, AF
2005	0	22,920
2006	0	24,614
2007	0	18,719
2008	0	21,572
2009	0	23,574
2010	0	29,845
2011	0	28,393
2012	0	23,883
2013	0	22,622
2014	0	7,855
2015	0	19,311

Scenario 4. Increased groundwater pumping by amounts of recycled water delivery, AF

Calendar Year	Increased Groundwater Pumping applied in the model, AF	Recycled water delivery, AF
1999	651	651
2000	746	746
2001	635	635
2002	495	495
2003	569	569
2004	1,162	1,162
2005	1,639	1,639
2006	1,782	1,782
2007	2,140	2,140
2008	2,183	2,183
2009	2,072	2,072
2010	1,761	1,761
2011	1,633	1,633
2012	1,940	1,940
2013	2,040	2,040
2014	2,015	2,015
2015	2,367	2,367

Appendix J

Technical Review Committee Comments on Study

Cameron Tana

From: Rebecca Louise Nelson <rebecca.nelson@unimelb.edu.au>
Sent: Friday, August 04, 2017 3:33 AM
To: Cameron Tana
Subject: RE: SCVWD zone of benefit study draft comments by Friday

Dear Cameron,

Thanks for the reminder. And thanks again for involving me in the project - it has been incredibly interesting, and I heartily congratulate everyone involved!

More than adding anything new, these comments capture what I understood to be some very helpful statements that responded to the questions that I had during the teleconference. I think it would be great to include clarifying information to this effect in the report.

Issue: simplification of boundaries
I understood the practical need to simplify complicated boundaries dictated by geology into something more amenable to efficient legal description. To help justify this process, it would be useful to give some indication/evidence of the difficulty/cost of having legal descriptions that mirror geological boundaries to head off any argument about arbitrariness of the simplified boundaries.
I saw this as an area of particular challenge in terms of minimizing the number of pumpers on the margins of charge zones who might want to challenge the drawing of the boundaries. It seems desirable to try to head off as many of these challenges as possible at the outset. It would be possible to draw a link between the simplification of boundaries, and a spatial representation of the uncertainty of boundaries (see below), eg if a parcel of land lies mostly within an 'error band' around a particular boundary, a conservative approach may be to exclude it from a charge zone. This could be contrasted with a parcel of land, most of which lies within an area of high confidence as being within a zone of benefit on the basis of geology.

Issue: Exemption procedures
The report describes a process for a pumper to apply for an exemption from a charge zone, and that there would be a shift from granting exemptions by parcel to exemptions by well. It would be useful to include the explanation that the reason for this change was to align with a greater focus on geology in the rest of the charge zone rationale. It would also be worth explicitly considering how to deal with a situation where one parcel holder has multiple wells. One consideration may be the burden that would be borne by one parcel holder having to pay high costs of producing geological information for multiple wells.

Issue: explicit treatment of uncertainty
It is worth mentioning that policy-related reports about groundwater seem to have an increasing tendency explicitly to reflect information about uncertainty, and how the uncertainty has been dealt with. Here, I distinguish uncertainty (eg relating to geological interpretation or using production wells for monitoring purposes) from conservative assumptions in terms of benefits (which I understand was the approach of the report). This is an unusual context for considering uncertainty, since it would not deal with uncertainty in terms of a variation in groundwater levels or volumes, but variation in a spatial boundary. I'm not entirely sure how one would represent it - but it would be worth some consideration. See one idea about the potential application of this to simplification of boundaries above.

Issue: Benefits of conservation activities/demand management
I found this part of the report particularly fascinating. It would be worth including the clarification that these benefits are treated as uniform not only because they are dispersed throughout the relevant regions, but also because the rebates were equally available to all. This could help deal with any criticism that focuses on the distribution of the actual take-up

of these rebates, ie that the volumetric benefit of the rebates in the groundwater context might be spatially non-uniform (eg on account of larger areas of irrigated open space in some neighbourhoods that results in a rebate leading to greater conservation, or a different mix of imported surface water vs groundwater in different regions etc).

Again, thank you very much for involving me in the project. I very much look forward to seeing the next stages. I noted down that there would be a stakeholder meeting and a Board meeting in October and November - I look forward to seeing the results.

Best regards,
Bec

Dr Rebecca Nelson | Senior Lecturer
Melbourne Law School

Room 942, Level 9, 185 Pelham Street, Carlton VIC 3053 Australia
T: +61 3 8344 0436 E: rebecca.nelson@unimelb.edu.au
unimelb.edu.au

This email and any attachments may contain personal information or information that is otherwise confidential or the subject of copyright. Any use, disclosure or copying of any part of it is prohibited. The University does not warrant that this email or any attachments are free from viruses or defects. Please check any attachments for viruses and defects before opening them. If this email is received in error please delete it and notify us by return email.

-----Original Message-----
From: Cameron Tana [mailto:cameron@hydrometricswri.com]
Sent: Tuesday, 1 August 2017 3:13 AM
To: Carl Hauge <tuleluke@hcc.net>; Rebecca Louise Nelson <rebecca.nelson@unimelb.edu.au>; rebeccalouisenelson@gmail.com
Cc: George Cook <GCook@valleywater.org>; Laura Brown <laura@hydrometricswri.com>
Subject: RE: SCVWD zone of benefit study draft comments by Friday

Carl, Rebecca-

Thank you again for your participation and feedback last week on our call discussing this study. As requested, this is a reminder that we have requested written comments by this Friday, August 4. I look forward to seeing them. Thank you.

Best, Cameron

-----Original Message-----
From: Carl Hauge [mailto:tuleluke@hcc.net]
Sent: Sunday, July 23, 2017 9:52 AM
To: Cameron Tana <cameron@hydrometricswri.com>
Cc: Rebecca Louise Nelson <rebecca.nelson@unimelb.edu.au>; rebeccalouisenelson@gmail.com; George Cook <GCook@valleywater.org>; Laura Brown <laura@hydrometricswri.com>
Subject: Re: SCVWD zone of benefit study draft download

Cameron—I have downloaded the draft report and have started reviewing it. I have not yet looked at the appendices.

11 August 2017

To: Cameron Tana

From: Carl Hauge

Subject: Comments on draft report, *Santa Clara Valley Water District Zone of Benefit Study*

First of all I will say that the amount of data that you have collected, evaluated and displayed in hydrographs, graphs, cross-sections and maps is mind-boggling. However, such an effort is necessary if groundwater management is to be effective, and user fees for that management are to be assessed equitably. The report provides the detail necessary to determine in which areas action by the District benefits groundwater users, and the hydrographs give some idea of the scale of that benefit.

I have not looked into the methodology that was used by the agencies you describe in Appendix A to develop their zones of benefit. You have outlined a detailed, data-driven method. As we commented during our telephone committee meeting, the methodology used in this report will serve as an example for the Groundwater Sustainability Agencies formed under SGMA. SCVWD has a municipal revenue source. Not all agencies have such a source of revenue. Nevertheless, I think this report provides useful guidelines.

Finally I repeat that I think that you and the District have done a remarkable job of collecting the data that are available, collating it appropriately, evaluating it, and coming to defendable conclusions to establish the 6 zones of benefit you have delineated. You will no doubt get a lot of comments during your workshops, but what is important is that you have begun a process that can only lead to better water management. And we need a lot more of such leadership!

I hope my comments below are useful.

1. Listing what is known about the different hydrogeologic properties of different rock types provides realistic parameters for differentiating zones of benefit.

2. Using these properties your delineation of potential zones of benefit appears to be reasonable. In Section 4.1 you describe Quaternary Alluvium. You might want to consider including brief geologic – hydrogeologic descriptions of the Santa Clara Formation and what you are calling bedrock to give the reader some information about the rock types that surround the basins and their hydraulic properties.

3. Figure ES-3 is an important figure but the explanations at the bottom are essentially illegible (I think even to younger people). I suggest you print the map on 1 page and the explanations on a separate page in a larger font.

4. A list of the variables that must be considered in evaluating zones of benefit would help the reader better understand:

   a. the complexity of defining zones of benefit, and
   b. the degree of precision or lack of precision of each of the estimated properties or values.

5. My count of the variables that affect groundwater availability includes:

   a. local precipitation
   b. local recharge
   c. amount of treated water available
   d. amount of recycled water available
   e. amount of local surface water available
   f. water saved thru conservation
   g. amount of groundwater extracted
   h. change in groundwater levels
   i. groundwater quality (although I understand quality is not a consideration in evaluating zones of benefit in this report)
   j. actions of local retailing water agencies
   k. hydrogeologic connectivity of aquifers and rock types
   l. bedrock boundaries
   m. population affecting water use
   n. number of active wells in retail agency areas

6. I would expect that some of your deduced values will be challenged during the public hearing procedures.

7. While I understand why inclusion of water quality in your list of variables would add another level of complexity, I do not think that groundwater quality can be ignored. The bottled water industry is reaping millions of dollars because of people's concerns about drinking water quality. You might want to more effectively highlight the District's actions to protect water quality. The State Water Board's recent setting of an MCL for TCP as a result of contamination in San Joaquin Valley reinforces people's concerns.

8. Appendix A: The description of other agencies' adoption of zones of benefit is a very useful reference.

9. Other appendices containing hydrographs show trends that are useful in establishing benefits. Appendix C shows a very clear increase in groundwater levels in all pumping areas with increased treated water delivery; Appendix D shows a very clear decreasing trend of managed recharge in all pumping areas in the Santa Clara subbasin; Appendix E shows no decrease of managed recharge in the Llagas subbasin. These are excellent tools for understanding the effects of variations that require management because the affect groundwater levels and availability.

10. The data sets available to you cover relatively short periods of time. While these data are useful, data collected over a longer period of time might be more representative of the variable being monitored. However, you have to work with what is available. This is a good example of the need for long-term monitoring to more efficiently manage water resources.

11. Table 10 in the report: You might consider adding “subsidence” and “salt water intrusion.”

Appendix K

Stakeholder Comments and Responses to Comments on Study

GREAT OAKS WATER COMPANY
P. O. BOX 23490
SAN JOSE, CA 95153
(408) 227-9540
tguster@greatoakswater.com

January 7, 2019

Sent Via Email

George Cook (*gcook@valleywater.org*)
Associate Engineering Geologist
Groundwater Monitoring and Analysis Unit
Santa Clara Valley Water District

RE: Comments and Questions to Preliminary Groundwater Zones of Benefit Study
Prepared by HydroMetrics Water Resources Inc. (HydroMetrics WRI)

Dear Mr. Cook:

These comments and questions are submitted on behalf of Great Oaks Water Company (Great Oaks) and pertain to the HydroMetrics WRI Preliminary Groundwater Zones of Benefit Study (Preliminary Study) dated October 2017. As several questions are included in this submission, Great Oaks' comments are to be considered preliminary, as the answers to those questions may result in additional comments and questions.

How, when, or if the Preliminary Study will be presented to the Santa Clara Valley Water District (District) Board of Directors (Board) for information and/or action is unclear. Great Oaks' first request is for the District to provide information about what the District intends to do with the Preliminary Study and when any such action is scheduled to take place. Please provide that information to Great Oaks and all other interested parties, including all water "retailers" in a timely manner that provides an opportunity to participate in any such action.

General Comments

1. District Activities Considered in Preliminary Study.

Based upon the October 31, 2017 Draft Technical Memorandum from Hydrometrics WRI to you, it is understood that the Preliminary Study only considered demonstrated benefits from two District activities when proposing zones of benefit: (1) managed aquifer recharge; and (2) delivery of treated water. According to that Memorandum, benefits from recycled water delivery support, untreated surface water deliveries, indirect potable reuse, and potential reuse are "either small, difficult to measure, or difficult to separate from the benefits of the two primary District activities."[1]

District activities are discussed in Section 5 of the Preliminary Study. Managed recharge and treated water deliveries are the first two activities discussed, but the Preliminary Study also includes discussion of District activities noted in the Draft Technical Memorandum – recycled water (Section 5.3) and surface water deliveries (Section 5.4). District conservation activities are also discussed in Section 5.5. It is believed, however, that consistent with the Memorandum, the beneficial effects, if any, of recycled water, surface water deliveries, and conservation activities were not factors used to propose or determine zones of benefit.

Great Oaks requests that the District confirm that only the beneficial effects, if any, of District managed recharge and delivery of treated water were and are to be considered when determining zones of benefit. Kindly advise if this is true for the Great Oaks and North Morgan Hill areas. This confirmation will permit a more focused approach to reviewing the methodology and conclusions of the Preliminary Study.

2. Groundwater Level Data Evaluation.

The Preliminary Study evaluates whether, during identified periods for evaluation, observed groundwater level data in a particular area shows a stable or increasing trend which indicates a benefit from a District activity.[2] The three factors considered to identify evaluation periods were rainfall, area pumping, and quantities of treated water deliveries and managed recharge provided by District activities.[3] One of those particular areas evaluated under this methodology is the Great Oaks pumping area, which is defined as Great Oaks' service area as shown in the California Public Utilities Commission grid maps.[4] The Preliminary Study correctly notes that Great Oaks' sole source of water is groundwater.[5]

It appears that the following periods were selected for evaluation for District-managed recharge: (1) 1942 – 1965; (2) 1975 – 1982; (3) 1987 – 1992; (4) 1998 – 2001; and

---

[1] Preliminary Study, Appendix L, page 1.

[2] *Id.*, at page 40.

[3] *Id.*

[4] *Id.*, at page 43.

[5] *Id.* Please also note Table 2 on page 34 which does not include the Great Oaks area among those receiving District treated water.

(5) 2006 – 2013.[6] In this regard, it should be noted that Great Oaks was established in 1959, so there was no pumping by Great Oaks prior to that time. Any decreasing groundwater levels in the Great Oaks area prior to 1959 cannot be in any way related to groundwater pumping by Great Oaks. Great Oaks did not begin water production in the North Morgan Hill area until May of 2005, so any decreasing groundwater levels in that area prior to May of 2005 cannot be attributed to Great Oaks' water production. Kindly confirm if this is a correct assessment.

According to the data provided on Table 4 of the Preliminary Study, during the period from 1959 through 1965, groundwater levels in the Great Oaks area were increasing. It appears that the Preliminary Study is crediting the District managed recharge for the increasing groundwater levels during this period of time more than fifty years ago. Great Oaks requests that the District advise Great Oaks if this is a correct interpretation of the data provided in the Preliminary Study. It would also be useful to know exactly where the District managed recharge activities occurred during this time period.

Also, according to the data provided on Table 4 of the Preliminary Study, there is insufficient data for the 1975 – 1982 and 1987 – 1992 evaluation periods to make any determination of whether District managed recharge had any beneficial effect on groundwater levels in the Great Oaks area for those time periods. Great Oaks requests that the District advise Great Oaks if this is a correct interpretation of the data provided in the Preliminary Study.

Then, Table 4 shows that during the 1998 – 2004 and 2006 – 2013 evaluation periods, groundwater levels were decreasing in the Great Oaks area during 1998 – 2001 and 2009 – 2013. This appears to be indicative of there being no demonstrable benefit from District managed recharge in the Great Oaks area during those time periods. Great Oaks requests that the District advise Great Oaks if this is a correct interpretation of the data provided in the Preliminary Study.

Table 5 of the Preliminary Study provides data pertaining to groundwater level trends during time periods of District treated water deliveries. The evaluation periods shown on Table 5 are: (1) 1975 – 1982; (2) 1987 – 1992; (3) 1998 – 2004; and (4) 2006 – 2013.

The Great Oaks area is listed on Table 5, although no treated water deliveries have ever been made to that area. The treated water deliveries by the District during this period of time also appear to have been made to areas that are relatively distant from the Great Oaks area. Please explain all of the factors involved in including the Great Oaks area on Table 5.

Table 5 also shows that groundwater level trends during the 1998 – 2004 and 2009 – 2013 time periods were decreasing. This appears to be indicative of there being no demonstrable benefit within the Great Oaks area from District treated water deliveries during those time periods. In fact, the Preliminary Study states, with respect to decreasing groundwater level trends during evaluation periods:

---

[6] *Id.*, Table 4, at page 54.

> In Appendices C-F, plots of groundwater level data by area stacked with the plots of rainfall, pumping by area, District activity quantities are shown with the shaded evaluation periods identified. If the plotted groundwater level trends during the shaded periods are stable or increasing, a benefit from a District activity during that period is demonstrated.[7]

Appendix C includes data plotted for the Great Oaks area for "Managed Recharge" and Appendix D includes data plotted for the Great Oaks area for "Treated Water Delivery." The data in Appendices C and D appear to correlate to the data provided in Tables 4 and 5. Great Oaks requests that the District advise Great Oaks if this is a correct interpretation of the data provided in the Preliminary Study.

Great Oaks also requests that the District indicate whether the benefits the Great Oaks area allegedly receives from District managed recharge and District treated water deliveries are direct or indirect benefits. If the benefits are said to be "indirect," please provide a full technical analysis supporting this conclusion. If the benefits are said to be "indirect," please provide a full technical analysis supporting this conclusion as well.

Finally, with respect to the groundwater level data evaluation provided in the Preliminary Study, it appears that there has been no demonstrable benefit in the Great Oaks area from District managed recharge since 1966 or from District treated water deliveries since 1982. Great Oaks interprets this data to mean that for approximately 53 years the District has no data supporting the conclusion that the Great Oaks area has benefitted from District managed recharge and for approximately 36 years the District has no data supporting the conclusion that the Great Oaks area has benefitted from District treated water deliveries. Despite this lack of data, however, the Preliminary Study concludes that Great Oaks should pay for benefits from both District activities through the groundwater charge levied in Zone A. And, the Preliminary Study concludes that the Great Oaks area should pay exactly the same amount as the areas where the treated water deliveries were actually made (*i.e.*, no attempt was made to allocate costs based upon actual, observed benefits even during times when no benefit was observed).

A better explanation is needed to explain why, in the absence of data demonstrating benefits, that Great Oaks will continue to be charged for benefits the District cannot demonstrate were provided. It appears that in proposed Zone A, Great Oaks would be paying the same amount (per Acre-Foot of water produced) as all other groundwater producers in that Zone when the data in the Preliminary Study indicates that such an allocation of costs to Great Oaks would be unreasonable and lacking in evidentiary support.

3. Hydrogeologically Connected Areas.

It may be that the Preliminary Study is relying upon the concept of hydrogeologic connectivity to conclude the Great Oaks area receives benefits from District activities in the absence of data supporting that conclusion. The Executive Summary indicates that the Preliminary "Study is based on the premise that benefits from District activities extend throughout areas connected by groundwater flow (called hydrogeologically connected areas) that occurs in similar geologic deposits."[8] This suggests that if a District activity provides any measurable (or theoretical) benefit to one portion of a hydrogeologically connected area, then that benefit is simply deemed to be provided to the entire hydrogeologically connected area in exactly the same manner and amount. Please confirm if this is how the concept of hydrogeologic connectivity is employed in the Preliminary Study.

---

[7] Id., at page 49.

District delivery of treated water serves as an example of this practice. As discussed above, no demonstrable benefits have been provided to the Great Oaks area from District treated water deliveries for approximately 36 years. Yet, the Preliminary Study concludes that the Great Oaks area should be charged for benefits from District treated water deliveries to others in the Santa Clara Plain in exactly the same manner and amount.

Interestingly, the Preliminary Study concludes that the North Morgan Hill area has also received no demonstrable benefits from District managed recharge since 1982 and has never received demonstrable benefits from District treated water deliveries.[9] The Preliminary Study, however, concludes that the North Morgan Hill area should be charged for benefits associated with District managed recharge, but not for benefits from District treated water deliveries, despite the fact that the North Morgan Hill area is part of the Santa Clara Plain.

The Preliminary Study separates the North Morgan Hill area of the Santa Clara Plain from the proposed Zone A through this explanation:

> [T]he treated water delivery is north of Coyote Narrows where a steep groundwater gradient potentially limits hydrogeologic connection. Therefore, it is more likely that the increasing groundwater level trends occurring during 1975-1982 are a result of managed recharge from Coyote Creek in the Coyote Valley area instead of treated water delivery to the north of Coyote Narrows.[10]

Based upon this explanation, the Preliminary Study concludes that the North Morgan Hill area should not be charged for costs associated with District treated water deliveries and should instead be in an area designated as Zone C, where only costs associated with District managed recharge are allocated.

Great Oaks requests that the District confirm that it is the relatively steep groundwater gradient in the Coyote Narrows that is the basis for this separation of the North Morgan Hill area from proposed Zone A. Great Oaks requests that this explanation discuss the details of how steep a groundwater gradient must be to overcome the general concept of hydrogeologic connectivity within the Santa Clara Plain. Great Oaks also requests information about and examples of other types of localized hydrogeologic features within the

---

[8] *Id.*, at page ES-3.

[9] *Id.*, at Tables 4 and 5, pages 54 and 55. *See also*, page 68.

[10] *Id.*, at pages 68 – 69.

Santa Clara Plain remove or reduce hydrogeologic connectivity within the groundwater basin.

Time Periods

The Preliminary Study appears to rely upon an arguably claimed benefit from treated water deliveries last observed during the 1975 to 1982 evaluation period to conclude that the Great Oaks area benefits from District treated water deliveries. And, it also appears to rely upon an arguably claimed benefit from District managed recharge last observed in 1966 – more than fifty years ago – to conclude that the Great Oaks area benefits from District managed recharge.

The time periods during which the alleged benefits were observed raises the question of how much time must pass with no observable benefits from either District managed recharge or District treated water deliveries before it is decided that those benefits are non-existent in the Great Oaks area. What information can you provide on this issue? Is it reasonable to conclude a benefit is being received if beneficial effects of a District activity have not been observed for 36 or even more than 50 years?

Conclusion

There is a great deal of information in the Preliminary Study, but the Preliminary Study also lacks essential information in several respects. Great Oaks hopes that through a continuing dialog more information will be provided, including the information requested in this letter. Through that continuing dialog, Great Oaks will work with the District to help refine the methodology and outcome of the Preliminary Study before action is taken by the District to implement the Preliminary Study's recommended zones of benefit.

If any of the observations or requests for information are in any way unclear, please contact the undersigned directly so that any such issues may be resolved as quickly as possible.

Respectfully submitted,

Tim Guster

Timothy S. Guster
Vice President and General Counsel
Legal and Regulatory Affairs

cc: Jennifer De La Piedra (via email)

GREAT OAKS WATER COMPANY
P. O. BOX 23490
SAN JOSE, CA 95153
(408) 227-9540
tguster@greatoakswater.com

July 19, 2019

Sent Via Email

Vanessa De La Piedra, P.E. (vdelapiedra@valleywater.org)
Unit Manager
Groundwater Monitoring and Analysis Unit
Santa Clara Valley Water District

George Cook (gcook@valleywater.org)
Associate Engineering Geologist
Groundwater Monitoring and Analysis Unit
Santa Clara Valley Water District

Dear Vanessa and George:

By letter dated January 7, 2019, I provided, on behalf of Great Oaks Water Company (Great Oaks), comments and questions about the October 2017 HydroMetrics WRI[1] Preliminary Zones of Benefit Study (Preliminary Study). A copy of my January 7, 2019 letter is attached.

Following that letter, we met and discussed many of the comments and questions. Since then, a new draft of the Preliminary Study dated April 2019 has been created and circulated for comment (April Draft). It is my understanding that the Preliminary Study may be presented to the Santa Clara Valley Water District (Valley Water) Board of Directors as soon as August 27, 2019.

None of the deficiencies in the data relied upon by the Preliminary Study have been rectified. The April Draft acknowledges the data deficiencies and addresses those deficiencies with broad assumptions about benefits from Valley Water activities directly or indirectly related to groundwater. Because the deficiencies in the original draft of the

---

[1] HydroMetrics WRI now appears to be known as "Montgomery & Associates."

Preliminary Study have not been addressed or corrected, Great Oaks' concerns remain the same.

Rather than address the deficiencies in the Preliminary Study, the April Draft glosses over those deficiencies and emphasizes assumptions for which there is no supporting data. The April Draft even includes this statement: "If data or modeling demonstrates that an area benefits from a District activity over *any* time period, the area is assumed to benefit from that activity over *all* time periods." (April Draft, p. 29 (emphasis added)) At the same time, the Preliminary Study includes actual data showing no measurable benefit from District activities during certain periods of time – facts that refute the assumption of benefits over "all periods of time."

It must be noted that the City of Palo Alto and Stanford University have also raised concerns and objections to the Preliminary Study and the April Draft, and those concerns and objections are both well-founded and unaddressed by the April Draft. The same concerns about the broad assumption of benefits simply due to "hydrogeologic connectivity" raised by Great Oaks are made by both the City of Palo Alto and Stanford University. Those concerns remain and are well-articulated in the comments provided from the City of Palo Alto and Stanford University.

Great Oaks met with Valley Water staff and a representative of the firm that prepared the Preliminary Study. Great Oaks was open and honest about its concerns. During that meeting, Great Oaks emphasized that relying upon assumptions without supporting data raise issues rather than justify charges for actual or assumed benefits from Valley Water activities. As Valley Water well knows, the charges levied by it for the "benefits" of its activities have been the subject of legal challenges for more than a decade. Great Oaks' efforts to solve the legal issues by pointing out the obvious deficiencies in the Preliminary Study were, however, to no avail.

It was long past due when Valley Water decided to evaluate the Benefit Zones, and there is no doubt that the lack of data supporting the long-assumed benefits caused concern among those at Valley Water responsible for legal compliance. But ignoring that the data collected does not support the allocation of costs for Valley Water activities is not a reasonable approach to solving the long-standing issue of cost allocation. Great Oaks encourages Valley Water to properly use the data collected, especially when that data refutes ongoing assumptions and the allocation of costs to those paying the groundwater charges.

Respectfully submitted,

Tim Guster

Timothy S. Guster
Vice President and General Counsel
Legal and Regulatory Affairs

Enclosure (January 7, 2019 letter)

Valley Water

Clean Water • Healthy Environment • Flood Protection

August 16, 2019

Mr. Tim Guster, Vice President and General Counsel
Great Oaks Water Company
P. O. Box 23490
San Jose, CA 95153

Subject: Great Oaks Water Company Comments on the Preliminary Groundwater Benefit Zone Study Report

Dear Mr. Guster:

Thank you for your letters dated January 7 and July 19, 2019 providing feedback on the Preliminary Groundwater Benefit Zone Study Report (Preliminary Report). The Santa Clara Valley Water District (Valley Water) also appreciates you taking the time to meet with us and Cameron Tana from Montgomery & Associates on March 6, 2019 to discuss your comments. The attached letter from Mr. Tana provides a detailed response to the concerns and questions raised in your letters. Since your July letter also supports and references comments from Stanford and the City of Palo Alto, the Valley Water responses to those agencies are also attached for your reference.

Valley Water voluntarily initiated this data-driven study to ensure well users are charged fairly and equitably for our activities benefitting groundwater in their area. The study methodology and findings were reviewed by independent experts, including Carl Hauge, former chief hydrogeologist of the California Department of Water Resources, who noted the “remarkable job of collecting the data that are available, collating it appropriately, evaluating it, and coming to defendable conclusions…”

The study relies on large amounts of data and considers multiple lines of evidence, including groundwater level trends, groundwater model results, and hydrogeologic connectivity. The latter two lines of evidence are important tools in defining areas of benefit since local groundwater basins span hundreds of square miles. We believe the Preliminary Report is comprehensive, and respectfully disagree with your assertion that it has deficiencies in proposing groundwater benefit zones.

Staff plans to present the study and recommended zones to the Valley Water Board of Directors on August 27, 2019. More information is available at https://www.valleywater.org/how-we-operate/board-meetings-agendas-minutes. Thank you again for your interest in the study, and for taking the time to meet with us and provide feedback. If you have any questions, please contact me at (408) 630-2964 or gcook@valleywater.org.

Sincerely,

George Cook, P.G.
Senior Water Resources Specialist
Groundwater Management Unit

cc: Cameron Tana, Montgomery & Associates
N. Hawk, G. Hall, V. De La Piedra

Attachments:
1) August **, 2019 Response to January 7, 2019 and July 18, 2019 Great Oaks Comments
2) August **, 2019 Response to July 16, 2019 Stanford Comments
3) August **, 2019 Response to July 20, 2019 City of Palo Alto Comments

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

www.elmontgomery.com
1814 Franklin Street, Ste. 501
Oakland, CA 94612
510.903.0458

August 16, 2019

George Cook
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3614

SUBJECT: GREAT OAKS WATER COMPANY COMMENTS RE: GROUNDWATER BENEFIT ZONE STUDY FOR SANTA CLARA VALLEY WATER DISTRICT

Dear Mr. Cook:

Timothy Guster of Great Oaks Water Company (Great Oaks) provided comments and questions to the preliminary Valley Water Groundwater Zones of Benefit Study (Study) in a letter dated January 7, 2019 and then followed up with a letter on July 19, 2019 stating that deficiencies identified in the first letter have not been addressed. This letter is meant to address the comments provided in the Great Oaks letters.

We had not previously addressed the Great Oaks comments directly because we met Mr. Guster along with Valley Water staff on March 6, 2019 as mentioned in the latest Great Oaks letter. In the meeting, we briefly provided clarifying responses related to the comments provided in the Great Oaks letters, but Mr. Guster redirected the focus of the meeting to his advice for strengthening the Study report. His very helpful advice was to provide more information on the overall benefit of the Valley Water activities. The revised draft of the Study report dated April 2019 and shared with Great Oaks and the other retailers included our implementation of Mr. Guster's advice as follows:

- Adding description of the history of Valley Water and groundwater benefits from Valley Water activities (Section 2.2)
- Expanding description of benefits to water budget in hydrogeologically connected areas (Section 6)

These revisions are included in the report to be included on the Board agenda for August 27, 2019.

We also have made revisions to address specific comments in the January 2019 Great Oaks letter. Having made these various revisions in an attempt to address Great Oaks concerns, we did not previously provide Great Oaks with responses to their comments. The July 2019

Great Oaks letter indicates that that the following specific responses to comments are necessary. Comments in the January 2019 letter are more extensive than the July 2019 letter so the responses are ordered based on the first letter, but also highlight where comments were reiterated in the second letter. We have split some of the Great Oaks comments into parts in order to organize our responses and facilitate cross-referencing previous responses.

Great Oaks January 2019 General Comment #1: District Activities Considered in Preliminary Study (page 2)

> *Based upon the October 31, 2017 Draft Technical Memorandum from Hydrometrics WRI to you, it is understood that the Preliminary Study only considered demonstrated benefits from two District activities when proposing zones of benefit: (1) managed aquifer recharge; and (2) delivery of treated water. According to that Memorandum, benefits from recycled water delivery support, untreated surface water deliveries, indirect potable reuse, and potential reuse are "either small, difficult to measure, or difficult to separate from the benefits of the two primary District activities."*[1]
>
> *District activities are discussed in Section 5 of the Preliminary Study. Managed recharge and treated water deliveries are the first two activities discussed, but the Preliminary Study also includes discussion of District activities noted in the Draft Technical Memorandum – recycled water (Section 5.3) and surface water deliveries (Section 5.4). District conservation activities are also discussed in Section 5.5. It is believed, however, that consistent with the Memorandum, the beneficial effects, if any, of recycled water, surface water deliveries, and conservation activities were not factors used to propose or determine zones of benefit.*
>
> *Great Oaks requests that the District confirm that only the beneficial effects, if any, of District managed recharge and delivery of treated water were and are to be considered when determining zones of benefit. Kindly advise if this is true for the Great Oaks and North Morgan Hill areas. This confirmation will permit a more focused approach to reviewing the methodology and conclusions of the Preliminary Study.*

M&A Response: The quotation in the first paragraph is provided out of context. This quotation is from Appendix L, which is a draft technical memorandum on "Process to Conduct Future Reviews of Groundwater Zones of Benefit." The following is an expanded quotation:

> Other District activities, such as recycled water delivery support, untreated surface water deliveries, indirect potable reuse, and potential direct potential reuse, provide a benefit but have contributions to the County's water budgets that are either small, difficult to measure, or difficult to separate from the benefits of the two primary District activities. Therefore, these other activities were not used for defining zones of

> benefit in the preliminary zone of benefit study. However, changes to the location of these activities could change the zones of benefit.

The discussion in Appendix L makes clear that these activities provide benefits and those benefits were considered and were factors in proposing groundwater benefit zones. For example, benefits from recycled water are evaluated with groundwater modeling in Study report Sections 9.2.4 and 9.4.4. Demonstrated benefits from these activities were not primarily used to define the groundwater benefit zones, but the Study does conclude that benefits from these activities do occur to groundwater users where the activities occur (see Study report Section 10.7).

Appendix L also makes it clear that these other Valley Water activities could be used to change zones of benefit in the future if the Valley Water activities change in the future: "Therefore, the zones of benefit should be reviewed if existing District activities have a substantial geographic change, District activities are eliminated, or new District activities are added."

Great Oaks January 2019 General Comment #2, part 1: Groundwater Level Data Evaluation (page 3)

> *…In this regard, it should be noted that Great Oaks was established in 1959, so there was no pumping by Great Oaks prior to that time. Any decreasing groundwater levels in the Great Oaks area prior to 1959 cannot be in any way related to groundwater pumping by Great Oaks. Great Oaks did not begin water production in the North Morgan Hill area until May of 2005, so any decreasing groundwater levels in that area prior to May of 2005 cannot be attributed to Great Oaks' water production. Kindly confirm if this is a correct assessment.*

M&A Response: The purpose of the Study is to demonstrate benefit of Valley Water activities to areas in order to establish zones. Retailer areas are used because they help distinguish what sources of supply are used for different areas. The Study evaluates benefits to pumpers in the specific areas like the Great Oaks retailer area, not the specific pumpers such as Great Oaks Water Company. If the benefit is demonstrated to areas, then zones are set up based on those areas to reflect that groundwater users in those areas benefit from Valley Water activities. It is not within the scope of the study to attribute decreasing groundwater levels to specific user production.

Great Oaks January 2019 General Comment #2, part 2: Groundwater Level Data Evaluation (page 3)

> *According to the data provided on Table 4 of the Preliminary Study, during the period from 1959 through 1965, groundwater levels in the Great Oaks area were increasing. It appears that the Preliminary Study is crediting the District managed recharge for the increasing groundwater levels during this period of time more than*

> *fifty years ago. Great Oaks requests that the District advise Great Oaks if this is a correct interpretation of the data provided in the Preliminary Study. It would also be useful to know exactly where the District managed recharge activities occurred during this time period.*

M&A Response: Yes, the Preliminary Study attributes increasing groundwater levels to Valley Water managed recharge from 1959-1965 because information for precipitation and population growth as a proxy for pumping indicate that groundwater levels would have declined without Valley Water managed recharge. Records of quantities of Valley Water recharge systems are not available for this time period, but all Valley Water recharge systems in the Santa Clara Subbasin have been in operation since 1935 (Study report Table 1). This includes managed recharge in Coyote Creek and the Coyote Percolation Pond in the Coyote Recharge System, which is located in the Great Oaks service area.

Great Oaks January 2019 General Comment #2, part 3: Groundwater Level Data Evaluation (page 3)

> *Also, according to the data provided on Table 4 of the Preliminary Study, there is insufficient data for the 1975 – 1982 and 1987 – 1992 evaluation periods to make any determination of whether District managed recharge had any beneficial effect on groundwater levels in the Great Oaks area for those time periods. Great Oaks requests that the District advise Great Oaks if this is a correct interpretation of the data provided in the Preliminary Study.*

M&A Response: It is incorrect to interpret that insufficient data is available during these periods. Rather, these periods are intentionally excluded from the analysis since they cannot be used to evaluate benefit from Valley Water activities under the study methodology. Table 4 and Table 5 have been revised to distinguish between periods when there are insufficient groundwater level data and periods that are not evaluated based on pumping, precipitation, and managed recharge quantities. Groundwater level data are only evaluated during periods when groundwater levels are expected to be decreasing without a Valley Water activity. 1975-1982 and 1987-1992 are periods when managed recharge quantities near Great Oaks decreased so these periods are not evaluated and are now marked “Not Evaluated Based on Pumping, Precipitation, and Managed Recharge Quantities” to distinguish from evaluation periods marked “Insufficient Data - Lacking Groundwater Level Data.”

Great Oaks January 2019 General Comment #2, part 4: Groundwater Level Data Evaluation (page 3)

> *Then, Table 4 shows that during the 1998 – 2004 and 2006 – 2013 evaluation periods, groundwater levels were decreasing in the Great Oaks area during 1998 – 2001 and 2009 – 2013. This appears to be indicative of there being no demonstrable benefit from District managed recharge in the Great Oaks area during those time*

> *periods. Great Oaks requests that the District advise Great Oaks if this is a correct interpretation of the data provided in the Preliminary Study.*

Great Oaks July 2019 Comment: Deficiencies in the Preliminary Study (1st paragraph of page 2)

> *Rather than address the deficiencies in the Preliminary Study, the April Draft glosses over those deficiencies and emphasizes assumptions for which there is no supporting data. The April Draft even includes this statement: "If data or modeling demonstrates that an area benefits from a District activity over* ***any*** *time period, the area is assumed to benefit from that activity over* ***all*** *time periods." (April Draft, p. 29 (emphasis added)) At the same time, the Preliminary Study includes actual data showing no measurable benefit from District activities during certain periods of time – facts that refute the assumption of benefits over "all periods of time."*

M&A Response: It is incorrect to interpret the Study results as indicating no benefit during a specific period. Current and historic demand consistently exceed natural recharge several times over. Pumping the total demand is not sustainable without Valley Water activities to supplement natural recharge (managed recharge) or reduce pumping through providing alternative water supplies (treated water, recycled water, and untreated water deliveries). Following the suggestion made by Great Oaks in our March 6, 2019 meeting, this has been described in more detail in Section 6 of the Study report, which shows Valley Water activities have been providing benefit to the water budget in all years. Therefore, if the groundwater level evaluation shows a benefit from Valley Water activities in one period, it is occurring in all periods even if the benefit is masked by other factors.

As such, Table 4 does reflect a decrease in groundwater levels in several areas during the periods 1998-2004 and 2006-2013; however, this does not indicate an absence of benefit from the Valley Water's managed recharge activities in those areas. Rather, the decrease in groundwater levels would be expected based on decreasing precipitation and stable or increasing groundwater pumping for the area during the 1998-2004 and 2006-2013 periods. Managed recharge likely provides a benefit by limiting the expected decrease without resulting in groundwater level increases. As a result, the decrease in groundwater levels during this period does not reflect an absence of benefit.

Based on the evaluation criteria, the groundwater level data do not independently demonstrate a benefit in the Great Oaks area from managed recharge during the 1998-2004 and 2006-2013 periods, but a benefit is occurring as demonstrated by previous periods. In years where groundwater levels decrease, it is not possible to show the amount of benefit received because it is not possible to determine exactly how much more groundwater levels would have decreased without Valley Water activities. However, this lack of comparative data also does not demonstrate an absence of benefit. To the contrary, benefits clearly are occurring as demonstrated by other periods and supported by the water budget (Section 6) and modeling (Section 9).

Great Oaks January 2019 General Comment #2, part 5: Groundwater Level Data Evaluation (page 3)

> *The Great Oaks area is listed on Table 5, although no treated water deliveries have ever been made to that area. The treated water deliveries by the District during this period of time also appear to have been made to areas that are relatively distant from the Great Oaks area. Please explain all of the factors involved in including the Great Oaks area on Table 5.*

M&A Response: One of the objectives of the Study is to evaluate whether benefits from Valley Water activities extend to areas beyond where the activities are located. All of the areas included in Table 5, such as the Great Oaks area, are areas within the Santa Clara Subbasin where Valley Water treated water is not delivered. Table 5 summarizes the analysis of groundwater levels in these areas to assess whether the benefits of treated water deliveries extend to these areas. The Study reflects that areas receiving Valley Water treated water benefit from those deliveries so those areas are excluded from Table 5.

Great Oaks General Comment #2, part 6: Groundwater Level Data Evaluation (page 3)

> *Table 5 also shows that groundwater level trends during the 1998 – 2004 and 2009 – 2013 time periods were decreasing. This appears to be indicative of there being no demonstrable benefit within the Great Oaks area from District treated water deliveries during those time periods. In fact, the Preliminary Study states, with respect to decreasing groundwater level trends during evaluation periods:*
>
>> *In Appendices C-F, plots of groundwater level data by area stacked with the plots of rainfall, pumping by area, District activity quantities are shown with the shaded evaluation periods identified. If the plotted groundwater level trends during the shaded periods are stable or increasing, a benefit from a District activity during that period is demonstrated.*

M&A Response: The groundwater level data do not independently demonstrate a benefit in the Great Oaks area from treated water deliveries during the 1998-2004 and 2009-2013 periods, but a benefit is occurring as demonstrated by previous periods and consistent with benefits to water budget by Valley Water activities in all years. Please see our response to January 2019 General Comment #2, part 4 for a full discussion of this.

Great Oaks January 2019 General Comment #2, part 7: Groundwater Level Data Evaluation (page 4)

> *Appendix C includes data plotted for the Great Oaks area for "Managed Recharge"*

> *and Appendix D includes data plotted for the Great Oaks area for "Treated Water Delivery." The data in Appendices C and D appear to correlate to the data provided in Tables 4 and 5. Great Oaks requests that the District advise Great Oaks if this is a correct interpretation of the data provided in the Preliminary Study.*

M&A Response: Yes, the data in Appendices C and D should correlate to the data provided in Tables 4 and 5.

Great Oaks January 2019 General Comment #2, part 8: Groundwater Level Data Evaluation (page 4)

> *Great Oaks also requests that the District indicate whether the benefits the Great Oaks area allegedly receives from District managed recharge and District treated water deliveries are direct or indirect benefits. If the benefits are said to be "indirect," please provide a full technical analysis supporting this conclusion. If the benefits are said to be "indirect," please provide a full technical analysis supporting this conclusion as well.*

M&A Response: Although the Study mentions that benefits can be direct or indirect, the Study does not define the distinction and distinguishing between direct and indirect benefits are not required to define groundwater benefit zones. The technical analysis requested is not within the scope of the Study.

Great Oaks January 2019 General Comment #2, part 9: Groundwater Level Data Evaluation (page 4)

> *Finally, with respect to the groundwater level data evaluation provided in the Preliminary Study, it appears that there has been no demonstrable benefit in the Great Oaks area from District managed recharge since 1966 or from District treated water deliveries since 1982. Great Oaks interprets this data to mean that for approximately 53 years the District has no data supporting the conclusion that the Great Oaks area has benefitted from District managed recharge and for approximately 36 years the District has no data supporting the conclusion that the Great Oaks area has benefitted from District treated water deliveries. Despite this lack of data, however, the Preliminary Study concludes that Great Oaks should pay for benefits from both District activities through the groundwater charge levied in Zone A. And, the Preliminary Study concludes that the Great Oaks area should pay exactly the same amount as the areas where the treated water deliveries were actually made (i.e., no attempt was made to allocate costs based upon actual, observed benefits even during times when no benefit was observed).*
>
> *A better explanation is needed to explain why, in the absence of data demonstrating benefits, that Great Oaks will continue to be charged for benefits the District cannot*

> *demonstrate were provided. It appears that in proposed Zone A, Great Oaks would be paying the same amount (per Acre-Foot of water produced) as all other groundwater producers in that Zone when the data in the Preliminary Study indicates that such an allocation of costs to Great Oaks would be unreasonable and lacking in evidentiary support.*

Great Oaks January 2019 Comment: Time Periods (page 5)

> *The Preliminary Study appears to rely upon an arguably claimed benefit from treated water deliveries last observed during the 1975 to 1982 evaluation period to conclude that the Great Oaks area benefits from District treated water deliveries. And, it also appears to rely upon an arguably claimed benefit from District managed recharge last observed in 1966 – more than fifty years ago – to conclude that the Great Oaks area benefits from District managed recharge.*
>
> *The time periods during which the alleged benefits were observed raises the question of how much time must pass with no observable benefits from either District managed recharge or District treated water deliveries before it is decided that those benefits are nonexistent in the Great Oaks area. What information can you provide on this issue? Is it reasonable to conclude a benefit is being received if beneficial effects of a District activity have not been observed for 36 or even more than 50 years?*

M&A Response: It is reasonable to conclude the benefit continues even if the groundwater level evaluation period that demonstrates the benefit is from many years ago. Information on the water budget (added as Section 6) shows that Valley Water activities have been providing benefit to the water budget in all years. Groundwater modeling (Section 9) also supports the conclusion that benefits continue to occur.

The time periods used in the groundwater level data evaluation are narrow and unlikely to demonstrate benefit by design. There are many factors that influence groundwater levels. The evaluation periods were specifically chosen to ensure factors other than Valley Water activities would not be the cause of the stable or increasing groundwater level trend used to demonstrate the benefit. The groundwater level data evaluation assesses time periods when precipitation and the area's groundwater pumping indicate that groundwater levels are expected to be decreasing. Therefore, when the Valley Water activity is stable or increasing during these time periods, stable or increasing groundwater level demonstrate benefit from the Valley Water activity to the area. Declining groundwater levels as expected based on precipitation and pumping do not demonstrate lack of benefit from the Valley Water activity as the activity likely benefit groundwater pumpers in the area by limiting those declines. As a result, the decrease in groundwater levels during a later period does not reflect a removal of benefit observed in an earlier period.

As long as Valley Water does not substantively reduce its activities, benefits from the Valley Water activity continue as demonstrated by an earlier period in the groundwater level data evaluation, the water budget evaluation, and modeling.

Our research and interpretation of groundwater benefit zones established by other California agencies does not present examples of varying charges based on distance from agency activities providing benefit. The relative benefit is likely to continuously change with distance from Valley Water activities, making it impossible to define zones based on a specific level of benefit from any particular activity.

Great Oaks General Comment #3a: Hydrogeologically Connected Areas (page 5)

> *It may be that the Preliminary Study is relying upon the concept of hydrogeologic connectivity to conclude the Great Oaks area receives benefits from District activities in the absence of data supporting that conclusion. The Executive Summary indicates that the Preliminary "Study is based on the premise that benefits from District activities extend throughout areas connected by groundwater flow (called hydrogeologically connected areas) that occurs in similar geologic deposits."*[8] *This suggests that if a District activity provides any measurable (or theoretical) benefit to one portion of a hydrogeologically connected area, then that benefit is simply deemed to be provided to the entire hydrogeologically connected area in exactly the same manner and amount. Please confirm if this is how the concept of hydrogeologic connectivity is employed in the Preliminary Study.*

Great Oaks Updated Comment #2: Concerns and Objections to Broad Assumption of Benefits due to "Hydrogeologic Connectivity"

> *It must be noted that the City of Palo Alto and Stanford University have also raised concerns and objections to the Preliminary Study and the April Draft, and those concerns and objections are both well-founded and unaddressed by the April Draft. The same concerns about the broad assumption of benefits simply due to "hydrogeologic connectivity" raised by Great Oaks are made by both the City of Palo Alto and Stanford University. Those concerns remain and are well-articulated in the comments provided from the City of Palo Alto and Stanford University.*

M&A Response: The Study does not rely upon the concept of hydrogeologic connectivity to conclude the Great Oaks, Palo Alto, or Stanford areas receives benefit from the Valley Water activities. It relies on the groundwater level data evaluation as supported by the groundwater modeling and water budget. The Study does not make conclusions about manner and amount of benefit because those determinations are not necessary to define groundwater benefit zones.

We have provided a similar response to Palo Alto and Stanford.

Great Oaks General Comment #3b: Hydrogeologically Connected Areas (pages 5-6)

> *Great Oaks requests that the District confirm that it is the relatively steep groundwater gradient in the Coyote Narrows that is the basis for this separation of the North Morgan Hill area from proposed Zone A. Great Oaks requests that this explanation discuss the details of how steep a groundwater gradient must be to overcome the general concept of hydrogeologic connectivity within the Santa Clara Plain. Great Oaks also requests information about and examples of other types of localized hydrogeologic features within the Santa Clara Plain remove or reduce hydrogeologic connectivity within the groundwater basin.*

Preliminary Response: The relatively steep groundwater gradient across Coyote Narrows where the bedrock constriction may limit hydrogeologic connectivity is the basis for Coyote Valley, including the North Morgan Hill area being in proposed Zone C and not Zone A. Section 4 includes evaluations of other hydrogeologic features that reduce hydrogeologic connectivity within the Subbasins. As also noted, however, the Study does not rely solely on the concept of hydrogeologic connectivity to demonstrate benefit from the Valley Water activities in the areas of recommended zone A. For these areas, the Study relies on the groundwater level data evaluation as supported by the groundwater modeling and water budget to demonstrate benefit. Groundwater level evaluation of the benefits in the North Morgan Hill area from treated water deliveries showed decreasing trends in all three evaluation periods. Therefore, the North Morgan Hill area is excluded from zone A that benefits from Valley Water treated water deliveries

Both the comments in the first Great Oaks letter and the advice provided in our March 6 meeting have been beneficial in helping us enhance the report and has also affirmed our conclusion that the Great Oaks area should be included in groundwater benefit zones A and C.

Sincerely,

MONTGOMERY & ASSOCIATES

Cameron Tana

Cameron Tana, P.E.
Principal Hydrologist

GREAT OAKS WATER COMPANY
P. O. BOX 23490
SAN JOSE, CA 95153
(408) 227-9540

October 8, 2019

Hand-Delivered

Santa Clara Valley Water District
Board of Directors
5750 Almaden Expressway
San José, CA 95118

RE: Board of Directors Meeting
October 8, 2019
Agenda Item 5.1 Additional Information on the Groundwater Benefit Zone Study

Dear Santa Clara Valley Water District Board of Directors:

With respect to Agenda Item 5.1 for today's meeting, Great Oaks Water Company (Great Oaks) offers the following additional information for your consideration:

1. The staff presentation provided for this Agenda item includes several comments and statements that require clarification and/or correction.
2. Valley Water staff did meet with representatives of Great Oaks, Stanford University (Stanford), and the City of Palo Alto (Palo Alto) on September 16, 2019 to discuss concerns about the Benefit Zone Study (Study).
3. During the course of that meeting, the three "retailers" expressed concern that the Study did not examine the level of benefits (*i.e.*, degree or grade) provided by Valley Water activities in the actual or prospective zones of benefit. The retailers all expected the Study to include this information.
4. It was revealed during the meeting that it is entirely feasible to examine the level of benefits provided (if any) from Valley Water activities in the actual or prospective

zones of benefit, but that such examination was not performed because Valley Water staff did not include such an examination within the scope of the Study.

5. Great Oaks, Stanford, and Palo Alto presented a proposal requesting that the level of benefits provided by Valley Water activities (referenced in the staff presentation as "a gradational approach to benefits") be examined and that zones of benefit be established based upon such an approach.

6. While the presentation associated with this Agenda item does confirm the concerns expressed by the three retailers, only perceived "negatives" about this proposal will be presented to the Valley Water Board of Directors (*see*, *e.g.*, Attachment 5, page 6).

7. These "negatives" only confirm that the method employed to establish the existence of benefits from Valley Water activities and the method employed in the Study are flawed and unreasonable, as they both fail to include the reality that such benefits (if any) are not distributed or received equally throughout existing or prospective zones of benefit. The result is that the cost of actual benefits are not allocated to those paying the groundwater charges in a reasonable manner.

8. The staff presentation includes three arguments against the proposal made by the retailers. Each argument only proves the necessity of further examining the level of benefits provided by Valley Water activities (if any).

    a. The acknowledgement that benefit levels may change every year supports the retailers' proposal and confirms that the current and proposed "one size fits all" approaches are flawed. It is unreasonable to charge full price for a benefit when the full benefit is not received by the payor of the charge. That reviewing benefit levels each year may be time consuming is an insufficient basis for continuing a process that produces unreasonable results.
    b. During the September 16, 2019 meeting, Valley Water's consultant for this project confirmed that the technology and capability exists to conduct the gradation of benefits study proposed by the retailers. Staff says it is "doubtful that even a refined model could adequately quantify benefits from Valley Water activities in localized areas to the degree needed to support the imposition of different zones/charges." However, as noted above, the consultant was never requested to perform this sort of analysis. Given that the technology and capability exist to perform the analysis, choosing not to do so is merely an attempt to avoid the issue, rather than to address the shortcomings of the current and proposed methods for determining zones of benefit.
    c. Arguing that "thresholds used to separate gradational zones would be arbitrary and likely challenged by other well users" also fails to address the issues raised by the retailers. Declaring such thresholds as "arbitrary" even before beginning such an analysis means that staff is assuming to know the outcome of a study that has not been performed.

9. Finally, at the September 16, 2019 meeting, it was suggested that a delay in implementing the "new" approach to determining zones of benefit would impact water producers identified as outside the "new" zones of benefit, as those water producers would have to continue paying groundwater charges under the "old" or current method. This, too, acknowledges, the flaws in the current method. If there are water producers paying groundwater charges who are not receiving benefits from Valley Water activities, and Valley Water has identified who those water producers are, immediate action should be taken to exempt those water producers from further groundwater charges.

Great Oaks requests that Valley Water continue to refine its methodology for establishing zones of benefit. Clearly, the current method is (and has been) obsolete for quite some time and it is clearly unreasonable to fail or refuse to use existing technology and capability to accurately establish zones of benefit. It is required by law and by Valley Water policy.

The end result desired by Great Oaks is simple: zones of benefit and the groundwater charges levied within such zones should be established so that the costs of providing the benefits is reasonably allocated to those paying for such benefits.

Respectfully submitted,

Timothy S. Guster

Timothy S. Guster
Vice President and General Counsel
Legal and Regulatory Affairs

CITY OF
PALO
ALTO

OFFICE OF THE CITY MANAGER

250 Hamilton Avenue, 7th Floor
Palo Alto, CA 94301
650.329.2392

July 20, 2019

Mr. George Cook:

Thank you for the opportunity to comment on Valley Water's Preliminary Groundwater Benefit Zones Study. The City of Palo Alto (Palo Alto) imports 100% of its potable water supply from the San Francisco Public Utilities Commission Region Water System (RWS or Hetchy Hetchy). Several other retail water agencies in the Northwest County also heavily rely on RWS water, benefiting the groundwater basin.

After Valley Water released a draft of the Benefit Zones Study several months ago, Palo Alto provided informal feedback to staff requesting a more thorough explanation of how Hetch Hetchy imports have been taken into account in the analysis. Palo Alto remains concerned that the full benefit of that imported water has not been fully factored in. The Benefit Zones Study relies heavily on modeling and "hydrogeologic connectivity", extending even beyond the county line, but that concept is not demonstrated in the report.

Stanford University, another Hetch Hetchy importer in the Northwest County, provided Valley Water with a Technical Memorandum (TM) dated June 28, 2019 from Luhdorff and Scalmanini Consulting Engineers. Palo Alto concurs with the findings in the TM and urges Valley Water to address the shortcomings in the findings. We look forward to working with you to come to a mutually agreeable resolution.

Sincerely,

DocuSigned by:
Ed Shikada
F2DCA19CCC8D4F9...

Ed Shikada

City Manager

Valley Water

Clean Water • Healthy Environment • Flood Protection

August 16, 2019

Mr. Ed Shikada, City Manager
City of Palo Alto
250 Hamilton Avenue
Palo Alto, CA 94301

Subject: City of Palo Alto Comments on the Preliminary Groundwater Benefit Zone Study Report

Dear Mr. Shikada:

Thank you for your letter dated July 20, 2019 providing feedback on the Preliminary Groundwater Benefit Zone Study Report (Preliminary Report). The Santa Clara Valley Water District (Valley Water) agrees that the use of San Francisco Public Utilities Commission (SFPUC) supplies by the City of Palo Alto and other retailers in northern Santa Clara County benefits the groundwater basin by easing pumping demands. However, the Groundwater Benefit Zone Study focuses on evaluating benefits from Valley Water activities, which are primarily funded by groundwater production charges collected in groundwater benefit zones.

While evaluating the full benefit of SFPUC deliveries is not within the scope of the Groundwater Benefit Zone Study, the Preliminary Report does conservatively account for SFPUC deliveries. It does so by limiting time periods analyzed to ensure groundwater level improvements can be attributed to Valley Water activities rather than other factors like decreased pumping due to SFPUC deliveries, or climatic conditions. The attached letter from our consultant, Montgomery & Associates, provides more detailed responses to your comments. Since your comments also support and reference comments from Stanford University, the Valley Water response to Stanford is also attached for your reference.

The study relies on large amounts of data and considers multiple lines of evidence, including groundwater level trends, groundwater model results, and hydrogeologic connectivity. The latter two lines of evidence are important tools in defining areas of benefit since local groundwater basins span hundreds of square miles.

Given the large areas being evaluated, relying in part on the hydrogeologic connectivity within basins is a scientifically sound and reasonable approach. In fact, a report produced for the City of Palo Alto to evaluate local groundwater supplies[1] notes the interconnected nature of groundwater, stating: *"In a large groundwater basin, estimation of the capacity of a smaller area within a basin is difficult because the smaller area is, by definition, unbounded. Groundwater moves freely between basin areas in response to hydraulic head. Therefore, pumping or recharge in one area of the basin has effects on the basin as a whole."*

We believe the Preliminary Report is comprehensive, and respectfully disagree with your assertion that there are shortcomings that have not been addressed. Staff plans to present the amended recommendation to the Valley Water Board of Directors on August 27, 2019. More information is available at https://www.valleywater.org/how-we-operate/board-meetings-agendas-minutes. Thank you again for your interest in the study, and for taking the time to provide feedback. If you have any questions, please contact me at (408) 630-2964 or gcook@valleywater.org.

---

[1] City of Palo Alto Groundwater Supply Feasibility Study, Carollo Engineers, April 2003

Sincerely,

George Cook, P.G.
Senior Water Resources Specialist
Groundwater Management Unit

cc: Cameron Tana, Montgomery & Associates
N. Camacho, N. Hawk, G. Hall, R. Callender, V. De La Piedra

Attachments: 1) August **, 2019 Response to July 20, 2019 City of Palo Alto Comments
2) August **, 2019 Response to July 16, 2019 Stanford University Comments

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

www.elmontgomery.com
1814 Franklin Street, Ste. 501
Oakland, CA 94612
510.903.0458

August 16, 2019

George Cook
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3614

SUBJECT: PALO ALTO COMMENTS RE: GROUNDWATER BENEFIT ZONE STUDY FOR SANTA CLARA VALLEY WATER DISTRICT

Dear Mr. Cook:

The City of Palo Alto (Palo Alto) provided a letter providing brief comments on Valley Water's Preliminary Groundwater Benefit Zone Study (Study) on July 20, 2019. Responses to the letter's comments are provided below. The letter also states concurrence with the findings of the technical memorandum dated June 28, 2019 from Luhdorff and Scalmanini Consulting Engineers (LSCE) provided by Stanford University. We recommend providing our August 16, 2019 letter providing responses to LSCE technical memorandum to the City of Palo Alto.

In addition to responding to Palo Alto's comments, we also evaluated a groundwater assessment for the Palo Alto area published in November 2018 that is not included in the Study (*Groundwater Assessment and Indirect Potable Reuse Feasibility Evaluation and Implementation Strategy by Todd Groundwater and Woodard and Curran)* prepared November 2018 for Palo Alto and Valley Water. We reviewed this study because it includes groundwater budget information and other relevant hydrogeologic information specific to the Palo Alto area.

RESPONSES TO PALO ALTO COMMENTS

1st Palo Alto Comment: *After Valley Water released a draft of the Benefit Zones Study several months ago, Palo Alto provided informal feedback to staff requesting a more thorough explanation of how Hetch Hetchy imports have been taken into account in the analysis. Palo Alto remains concerned that the full benefit of that imported water has not been fully factored in.*

M&A Response: The groundwater level evaluation accounts for the effects of in-lieu recharge by San Francisco Public Utilities Commission Regional Water System (RWS or Hetch Hetchy) imports to ensure any related benefits are not misattributed to a Valley Water activity. This is accomplished by selecting evaluation periods based on pumping because Hetch Hetchy imports provide benefits of in-lieu recharge by decreasing pumping.

The groundwater level data evaluation identifies periods when climatic conditions and pumping in an individual retailer area would result in an expected decreasing groundwater level trend without a Valley Water activity in the retailer area. Periods when pumping within any retailer area is declining are not evaluated. This effectively removes periods when a groundwater level increase could be attributed to in-lieu recharge to the area, such as the delivery of Hetch Hetchy imported water (see Section 8-8.1.2 in the Study report). The groundwater level data evaluation removes these periods from the analysis to conservatively avoid attributing related groundwater level improvements to Valley Water activities when other factors could be the cause.

The groundwater modeling evaluation compares simulations where the only change is the volume of Valley Water activity. This comparison removes the effect of Hetch Hetchy imports on the evaluation of benefits from the Valley Water activity (see Section 9.1 in the Study report).

The groundwater benefit zone study is limited to recommending zones only from Valley Water activities. Although effects of non-Valley Water activities are accounted for in the study as described above, benefits from non-Valley Water activities are not evaluated because groundwater charges are based only on the costs of Valley Water activities that benefit each zone. Valley Water does not set charges based on the groundwater basin benefits resulting from Hetch Hetchy deliveries.

2nd Palo Alto Comment: *The Benefit Zones Study relies heavily on modeling and "hydrogeologic connectivity", extending even beyond the county line, but that concept is not demonstrated in the report.*

M&A Response: The Study describes the hydrogeologic connectivity between Valley Water activities and Palo Alto, but primarily uses the groundwater level trend evaluation to demonstrate benefits from Valley Water activities in the Palo Alto area. The groundwater level trend evaluation demonstrates a benefit from Valley Water activities but could not distinguish between benefits from the two largest Valley activities, managed aquifer recharge and treated water delivery. For the Palo Alto area, modeling is used to support the groundwater level trend evaluation by showing that benefits occur from both of the two largest Valley Water activities as well as from recycled water deliveries.

The Study does not evaluate benefits from Valley Water activities beyond the County lines because the District Act does allow Valley Water to charge for groundwater usage outside of Santa Clara County even if benefits occur beyond the County line.

EVALUATION OF 2016 GROUNDWATER ASSESSMENT OF PALO ALTO AREA

The Study does not cite the *Groundwater Assessment and Indirect Potable Reuse Feasibility Evaluation and Implementation Strategy* (IPR report, Todd Groundwater and Woodard and Curran) prepared November 2018 for Palo Alto and Valley Water, but it should be noted that the study area used in the IPR report to evaluate Palo Alto pumping yields and indirect potable use strategies includes the Valley Water activities for managed aquifer recharge at Stevens Creek and delivery of treated water to City of Mountain View and the Los Altos District of California Water Service (Cal Water).

Table 3-5 of the IPR report summarizes the contemporary average annual water balance for the study area and includes 1,420 acre-feet per year (AFY) of percolation releases by Valley Water along Stevens Creek. Pumping in this water balance would be higher by more than 1,180 AFY if not for Valley Water in-lieu recharge based on the 2005-2014 average for treated water deliveries to City of Mountain View. The 2005-2014 average for Valley Water treated water deliveries to the California Water Service Company (Cal Water) totaled approximately 9,500 AFY. Cal Water delivers that water to the City of Los Altos within the study area and a portion of the City of Cupertino outside of the study area. Without these Valley Water contributions to the water balance for the IPR report study area, the pumping yield available for Palo Alto would be significantly lower than the 2,900 AFY estimated by the IPR report.

In addition, the IPR report states the future baseline simulation using the groundwater model estimates the net average annual groundwater inflow from other areas of the Santa Clara Plain into the study area at approximately 2,300 AFY. This inflow is used to evaluate Palo Alto pumping yields and indirect potable use strategies. This provides additional, independent analysis indicating that Valley Water activities south of the study area have benefits to the study area.

Our assessment of the IPR report is that it is has affirmed our conclusion that the Palo Alto area should be included in groundwater benefit zone A.

Sincerely,
MONTGOMERY & ASSOCIATES

Cameron Tana

Cameron Tana, P.E.
Principal Hydrologist

Stanford University SUSTAINABILITY AND ENERGY MANAGEMENT

Vanessa De La Piedra, P.E. *via email to vdelapiedra@valleywater.org* March 23, 2018
Unit Manager, Groundwater Monitoring and Analysis Unit
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

Subject: Zones of Benefit Study

Dear Ms. De La Piedra:

Thank you for the opportunity to review the subject draft Zones of Benefit Study report. Stanford is reviewing the report, and is intending to prepare comments on it. Given the reliance of the study on a groundwater flow model in finding that benefits of SCVWD activities extend to the northern boundary of the Santa Clara Valley Basin, we would appreciate an opportunity to review additional information on the model used to determine Zones of Benefits, including:

1. Documentation of the original CH2MHill groundwater flow model (1991/2), and modifications thereto that were made in preparing the current findings and report;
2. Groundwater model files, along with descriptions of:
   a. The boundary conditions along San Francisquito Creek (the San Mateo – Santa Clara County line), and;
   b. Aquifer parameters.
3. Baseline and scenario assumptions, such as distinctions in the quantity of natural versus managed recharge in stream channels, that were assumed in deriving scenarios related to benefits; and
4. Thresholds of significance that were used in applying model results to Zones of Benefit findings.

Please let me know how we can receive or access this information, in order to complete our review and comments.

Sincerely,

Tom W. Zigterman

Tom W. Zigterman, P.E., D.DRE
Director, Water Resources & Civil Infrastructure

c: Rob Donlan, Ellison, Schneider, Harris and Donlan
Tom Elson, Luhdorff & Scalmanini
Peter Leffler, Luhdorff & Scalmanini

Stanford University SUSTAINABILITY AND ENERGY MANAGEMENT

Vanessa De La Piedra, P.E., Unit Manager *via email to vdelapiedra@valleywater.org* May 11, 2018
George Cook, Specialist *via email to gcook@valleywater.org*
Groundwater Monitoring and Analysis Unit
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

Subject: Zones of Benefit Study – Stanford comments

Dear Ms. De La Piedra and Mr. Cook:

Thank you for the opportunity to review the subject draft Zones of Benefit Study report, and for supplying additional information in response to our March 23 letter. We and our consultants, Luhdorff & Scalmanini Consulting Engineers (LSCE), have prepared technical comments on the study – see the accompanying LSCE Technical Memorandum dated May 7, 2018.

This Technical Memorandum enumerates several major concerns about the study's approach to modeling regional groundwater and particularly the study's conclusion that SCVWD groundwater recharge activities (that are several miles away from Stanford and the San Francisquito Cone) benefit the Stanford area. Stanford has long maintained that no demonstrable benefit from SCVWD groundwater recharge activities exists, and therefore the groundwater pumping fees are unjustified. Notwithstanding the flawed modeling approach, the Zone of Benefit Study fails to substantiate any material benefit from SCVWD's groundwater augmentation and management activities.

We would welcome an opportunity to discuss our comments in more detail with you and your consultant, particularly because several SCVWD groundwater staff are new and were not involved in Stanford's prior discussions with SCVWD on these matters several years ago. In light of the identified flaws with the Study and modeling approach, we urge SCVWD to hold off on finalizing the Study or using the Study to support decisions regarding groundwater management or pumping fees until these significant comments are addressed.

Please let me know some dates and times that we can meet. We look forward to continuing our discussions and reaching appropriate conclusions on this important issue.

Sincerely,

Tom W. Zigterman

Tom W. Zigterman, P.E., D.DRE
Director, Water Resources & Civil Infrastructure

c: Rob Donlan, Ellison, Schneider, Harris and Donlan
Tom Elson and Peter Leffler, Luhdorff & Scalmanini Consulting Engineers
Karla Daily, Palo Alto

WATER RESOURCES & CIVIL INFRASTRUCTURE GROUP
327 Bonair Siding, Stanford, CA 94305-7272 T 650-725-8081 F 650-723-3191

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

GROUNDWATER RESOURCES
Hydrology · Development · Management

Technical Memorandum

DATE: May 7, 2018 PROJECT: 14-2-067

TO: Tom Zigterman
Stanford University

FROM: Peter Leffler and Tom Elson

SUBJECT: **PRELIMINARY REVIEW COMMENTS ON SCVWD ZONE OF BENEFITS STUDY**

Luhdorff & Scalmanini Consulting Engineers (LSCE) was requested by Stanford University to review the Santa Clara Valley Water District (SCVWD) Draft Zone of Benefits (ZOB) study dated October 2017. Our review of the ZOB study included a request of selected supporting documents and model files from SCVWD. The requested model reports were subsequently provided to Stanford University along with a portion of the requested model files. Our review comments provided below relate to the ZOB study, the referenced supporting model documentation, and the subset of model files that were provided in response to Stanford's data request.

1) It is important to note that the Zone of Benefits (ZOB) study provides for inclusion of the Stanford area in the ZOB based primarily on groundwater model simulation results. The groundwater level data analysis method, utilizing data only from a 2011 to 2013 time period, was clearly of insufficient duration to prove a benefit to the Stanford area. Due to lack of evidence from the groundwater level analysis, it is very important to evaluate model characteristics and consider likely accuracy of groundwater model predictions in the Stanford area.

2) Our review of all available groundwater level data for the five Stanford wells (the ZOB study only uses three wells) shows a net stable to decreasing trend in water levels during the one evaluation period (2011-2013) used in the study. This is in contrast to the ZOB study claim of stable groundwater levels in the Stanford area during this time (page 68). Furthermore, there was a decreasing water level trend in the adjacent Palo Alto area (Table 8, page 67 of ZOB study) for the 2011-2013 evaluation period. Stanford and Palo Alto overlie a distinct physiographic area in the Santa Clara Valley known as the San Francisquito Cone. Thus, groundwater level trends in Palo Alto and Stanford should be interpreted together as being representative of the Cone, as such, groundwater level trends indicate a definite lack of benefit from District recharge and management activities.

3) The model uses no-flow boundaries along San Francisquito Creek, which also represents the County line and a jurisdictional boundary between Santa Clara Valley Groundwater Basin and San Mateo Plain Groundwater Basin. The justification provided in the Hydrogeologic Interpretation TM for using a no-flow boundary here is it represents a groundwater divide. However, this is poor justification for use of a no-flow boundary condition at this location because it artificially increases model-predicted changes in groundwater levels in the Stanford area from SCVWD recharge activities to the south. This is because the induced stress cannot be dissipated across the County line as will happen in reality (i.e., some of the change in groundwater levels will occur north of the County line and result in less change in groundwater levels in the Stanford area). In summary, the accuracy of model predictions will tend to be poor along model boundaries (especially along no-flow boundaries) compared to locations in the interior of the model domain and this is especially germane to conclusions of benefits in the Stanford-Palo Alto area.

4) The Model Hydrogeologic Interpretation TM states the groundwater model project area includes the southern half of the San Francisquito Cone/Subarea (pages 4-1 to 4-4), which is an area that includes Stanford University. DWR Bulletin 118 describes the Stanford area as part of the San Francisquito alluvial cone. San Francisquito Creek flows through the middle of the alluvial cone and is underlain by the most permeable sediments in the cone, which suggest this location is a poor choice for a model boundary location for the stated purposes of the ZOB study. Given the distinct hydrogeologic features of the San Francisquito Cone and Subarea, the model domain should have included the full extent of the San Francisquito Cone (extending north to Redwood City) and utilized different boundary conditions, such as general head, along the northern boundary of the model to more accurately represent the Stanford area and provide more accurate and reliable model predictions in this area. The incorporation of only half of San Francisquito Cone in the model domain and installation of a no-flow boundary through the middle of the Cone results in poor model simulation results in the Stanford area for the ZOB study.

5) Review of model files relative to horizontal hydraulic conductivity (K) in the Stanford area indicate values in the range of 5 to 10 feet/day. These K values are relatively low compared to site-specific studies and data evaluated by LSCE. Available data for the main portion of San Francisquito Cone indicate hydraulic conductivity values on the order of 10 to 85 feet/day for sediments in the depth range of 150 to 600 feet below ground surface. Use of lower than actual K values in the model will tend to result in overestimation of changes in groundwater levels in the Stanford area, thus over estimating effects from SCVWD recharge activities to the south.

6) Review of model files relative to specific yield (Sy) and storage coefficient (S) values in the Stanford area indicate a uniform Sy value of 0.07 and a uniform S value of 0.0001. These aquifer storage properties represent relatively low values and will tend to result in overestimation of changes in groundwater levels in the Stanford area, thus over estimating effects from SCVWD recharge activities to the south.

7) Based on review of model documentation reports, it does not appear that the model incorporates any stream percolation from San Francisquito Creek where there is a connection to the unconfined aquifer. Given the permeable nature of surficial sediments along upper reaches of San Francisquito Creek, it is expected that natural stream percolation may be a substantial source of water for the Stanford area. It is also not clear if the model accounted for artificial recharge in Lake Lagunita on the Stanford University Campus and irrigation return flows from application of SFPUC system surface water. The apparent lack of accounting for these sources of

recharge to the Stanford area would tend to result in overprediction of the effects of SCVWD recharge activities to the south. The model files provided to us did not include recharge inputs to the model, so this aspect of the model could not be verified.

8) Based on review of model documentation reports, there were no wells in the Stanford area used in model calibration. In addition, the model calibration period began in 1970, and does not capture the maximum period of basin stress in the early 1960’s. Stanford area groundwater levels had already recovered approximately 100 feet due to import of SFPUC system water by Palo Alto and Stanford by the beginning of the model calibration period in 1970. These factors result in greater uncertainty regarding the validity of model predictions in the Stanford area.

9) The nearest SCVWD recharge facility is approximately nine and a half miles south of the Stanford area. There was an inability to fully document benefits to Stanford University from review of groundwater level data in the SCVWD ZOB study, and there were small model-predicted changes in groundwater levels in the Stanford area from District activities. Given the various factors cited above, model-predicted changes in groundwater levels are almost certainly over-estimated and not reliable as a basis for determining whether or not Stanford University is within the Zone of Benefits.

10) Non-facility recharge is not well documented in the model report. It is not clear what assumptions are used in terms of natural streambed percolation recharge that would occur without SCWVD facilities vs. the amounts attributed to being related to SCVWD facilities.

11) The discussion and summary of non-facility recharge (page 4-62 of Hydrogeologic Interpretation TM) are acknowledged as being too low, including an apparent estimate of zero recharge attributed to non-facility streams. This does not even consider how much natural recharge would occur on facility streams in the absence of District facilities (i.e., some stream recharge attributed to SCVWD facilities would likely occur naturally in the absence of SCVWD facilities).

12) Recharge from precipitation is quite low (0 – 1.5 inches) relative to total precipitation (14 to 37 inches) throughout the model domain and amounts to only about five percent of total precipitation. As with the apparent underestimation of natural stream recharge cited above in Comments 7, 10, and 11, underestimation of rainfall recharge tends to place greater importance on SCVWD recharge activities (i.e., SCVWD artificial recharge constitutes a greater than actual proportion of the total basin recharge) than likely occurs in reality for the groundwater basin.

13) The model results figures in the ZOB study (e.g., Figures 38 and 39 on pages 78 and 79) do not specify what model layer is being represented by results displayed in the figure. Model results will almost certainly vary by model layer. Appendix H of the ZOB study refers to some additional model files (e.g., GIS shapefiles related to model assumptions, output head files) that may be useful in better understanding these model results; however, these and other important model files were not included in the model files provided to us. The intent of our original model file data request was to obtain all relevant model files; however, we only received a subset of the model files utilized in the ZOB study.

14) The ZOB study did not establish a threshold of significance for a District benefit to a given area. While the minimum model-determined benefit determined in the study was stated to be 3.9 feet (and appears to occur in the Stanford area based on Figure 39 of the ZOB study), the actual benefit in the Stanford area is likely much less than 4 feet due to reasons cited above. It is not clear how the Stanford area experiences any significant benefit from groundwater level increases that are likely to be less than two feet from District-related activities.

15) The ZOB study fails to establish a proportionate range of benefits to acknowledge large benefits in some areas versus minimal to negligible benefits in other areas. It is not reasonable for pumping tax fees to be similar for areas experiencing more than 100 feet of groundwater level increase benefits versus areas experiencing less than 2 to 4 feet of groundwater level increase from District activities.
16) Inasmuch as the model appears to simulate minor benefits that are arguably unrealistic, it should be noted that the siting and construction of SCVWD facilities was based on historic cost benefit analyses in which no benefit (such as up to 4 feet of water level increase as in the model result) was allocated or even described as a project objective for northern areas including the Stanford campus. In fact, records indicate that chronic water level declines due to over pumping in the northern areas were addressed by importing water from the San Francisco regional supply system. This measure was a solution distinct from the recharge facilities now evaluated in the ZOB study.

Overall, there are four major points to summarize from our review of the ZOB study. First, the groundwater level data analysis performed for the Stanford area utilized only one short evaluation period from 2011 to 2013, and our review of a more comprehensive data set indicates stable to decreasing water levels in contrast to ZOB study conclusions. Regardless, the Stanford/Palo Alto area is so distant from the nearest SCVWD recharge facility that it would be essentially impossible to distinguish a small SCVWD benefit in local groundwater level data from the likely more prominent effects of local recharge and pumping.

Second, there are several characteristics of the SCVWD groundwater model in the Stanford area that will tend to cause the model to incorrectly predict greater groundwater level changes attributed to District recharge activities than would be expected to occur in reality. Given that the groundwater model is the primary method applied in the SCVWD ZOB study to conclude that Stanford is within the zone of benefits, modifications to the groundwater model are needed to provide valid and more reliable predictions of groundwater level changes in the Stanford area.

Third, there is a need to establish a level of significance (with sufficient justification for the selected threshold) to estimated groundwater level changes in a given area for which a true benefit is derived from District recharge activities.

Fourth, to the extent that some areas may be shown to exceed the threshold of significance for deriving benefits, there needs to be a sliding scale of pumping assessment rates such that areas receiving only minimal benefits (e.g., less than five feet of groundwater level increase) pay lower rates than areas receiving maximum benefits (e.g., over 100 feet of groundwater level increase) from District recharge activities. While this final point is a matter of fair allocation, the District's study does not provide compelling evidence of even a minimal benefit to the Stanford and Palo Alto area.

5750 Almaden Expressway, San Jose, CA 95118-3614 | (408) 265-2600 | www.valleywater.org

Santa Clara Valley
Water District

November 20, 2018

Mr. Tom Zigterman
Stanford University
Water Resources & Civil Infrastructure Group
327 Bonair Siding
Stanford, CA 94305-7272

Subject**:** Response to Stanford Comments on Preliminary Groundwater Benefit Zone Study Report

The Santa Clara Valley Water District (District) appreciated the opportunity to meet with you July 9, 2018 to discuss your comments on the Preliminary Groundwater Benefit Zone Study Report (Preliminary Report). Although the Preliminary Report will not be finalized until stakeholder engagement is completed, the District would like to forward Montgomery & Associates' (formerly Hydrometrics Water Resources Inc.) response to your comments and send the additional information you requested. The attached hydrographs present your wells grouped together, as well as individually, as you requested.

As we have discussed, the District continues to seek input from stakeholders on this study. If you have any additional information that you believe will inform the study conclusions and recommendations, please let us know. Thank you again for the opportunity to meet with you and discuss the study results. If you have any questions, please contact me at (408) 630-2964.

Sincerely,

George S Cook Jr
George Cook, P.G.
Senior Water Resources Specialist
Groundwater Management Unit

ecc: Cameron Tana, Montgomery & Associates
N. Hawk, G. Hall, V. De La Piedra

Attachments: Montgomery & Associates' Response
Stanford Well Hydrographs

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

www.elmontgomery.com
1814 Franklin Street, Ste. 501
Oakland, CA 94612
510.903.0458

October 26, 2018

George Cook
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3614

SUBJECT: STANFORD UNIVERSITY COMMENTS ON PRELIMINARY GROUNDWATER ZONE OF BENEFIT STUDY FOR SANTA CLARA VALLEY WATER DISTRICT

Dear Mr. Cook:

Stanford University (Stanford) provided comments on the preliminary Zone of Benefit (ZOB) Study (study) which identifies areas within Santa Clara County that benefit from District activities. One of Stanford's main comments is that the "study provides for inclusion of the Stanford area in the ZOB based primarily on groundwater model simulation results." Groundwater model simulation results are not the primary basis for inclusion of the Stanford area in the ZOB. The primary bases for the inclusion of the Stanford area in the ZOB are the groundwater level trend evaluation and information about hydrogeologic connections. The model provides supplemental information about whether the Stanford area benefits from specific District activities to conclude which zone it should be in. We believe we can clarify the reasoning behind using the groundwater level trend evaluation to conclude that groundwater pumpers in the Stanford area benefit from District activities and the area should be included in the ZOB.

GROUNDWATER LEVEL TREND ANALYSIS FOR STANFORD WELLS

One source of confusion stems from the fact that groundwater level trends from two of Stanford's wells are grouped into the adjacent Palo Alto area trend analysis because they are located in the City of Palo Alto's service area. These two wells west of Sand Hill Road (Stanford wells 1 and 2 or 06S03W03L010 and 06S03W03M010, respectively) are separated from the rest of the Palo Alto area by the Stanford area, and they should therefore be grouped and evaluated with the Stanford area instead of the Palo Alto area (see attached revised hydrographs with this grouping and graphs for Stanford wells individually).

The study evaluated only time periods when groundwater levels are expected to be decreasing without the District activity and District activity is stable or increasing. Stable or increasing groundwater levels identified during these periods could then be attributed to the District activity. Including Stanford wells 1 and 2 with the Stanford area adds more data to the 2011-2013 period evaluated in the report, but also allows the 1978-1982 and 1998-2004 periods to be evaluated.

Stanford well 1 shows a stable or increasing groundwater level trend in both the 1978 to 1982 and 1998 to 2004 periods, when we expect groundwater levels to decline without the benefit of District activities. Stanford well 1 data from the 1978-1982 period show a stable trend when both District activities of managed recharge and treated water delivery are stable or increasing. Stanford wells 1 and 2 data from the 1998-2004 period shows an increasing trend when the District activity of treated water delivery is increasing. Similar trends during these periods are also observed in the Palo Alto area south of Stanford and at wells south of Palo Alto towards San Jose.

Although the groundwater level trend evaluation for the Stanford area identifies benefits from District activities, and justifies including Stanford in the ZOB, it is only able to distinguish that benefits are from the treated water delivery activities based on the 1998-2004 period when volumes of managed aquifer recharge are declining. The 1978-1982 and 2011-2013 periods are overlapping periods when both District activities are stable or increasing, so benefits from managed aquifer recharge cannot be distinguished from treated water delivery benefits (see preliminary study report section 6.2.4). The model is used to evaluate effects from the District activities separately and concludes that the simulated benefits from the activities are similar. Therefore, Stanford area is included in Zone A for benefits from both activities.

HYDROGEOLOGICAL CONNECTION WITH DISTRICT ACTIVITIES

Even with this clarification, we acknowledge that there are limitations in the data from, and modeling of, the Stanford area used in the study. However, as the report states in its summary of the methodology (Section 1.2, page 3):"If data and modeling are insufficient to assess whether an area benefits from District activities, the following assumptions are made: …benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity."

The study report should also be revised to document that the Stanford area is hydrogeologically connected to the report's Zone A: defined as the Unconsolidated Alluvium of the Santa Clara Plain. Evidence of the hydrogeological connection include:

- Unconsolidated alluvium is continuously mapped to include the Stanford area
- The 2015 USGS report (Wentworth et al., 2015) identifies continuous sedimentary stratigraphy from San Jose to the Palo Alto area

- Contour maps of groundwater level data including data from the Stanford area show continuous groundwater flow from areas of District activities north to Palo Alto.

The Stanford comments point to DWR's 1967 Bulletin 118, identifying the Stanford area as part of San Francisquito Cone, as evidence of a lack of hydrogeologic connection to the rest of proposed Zone A to the south. It does not, however, provide sufficient evidence to override more recent evaluations.

- While the San Francisquito Cone is identified as a physiographic feature of the Valley, this does not imply that the San Francisquito Cone is hydrogeologically separate. Other identified physiographic features are hydrogeologically connected with each other.

- The map of alluvial thickness (Plate 3) show thickness increasing to the south of San Francisquito Cone without obvious discontinuities.

- A pumping test at the Hale Street well showed drawdown to the south, toward what is defined as the San Francisquito Cone/San Jose Plain boundary. Bulletin 118 evaluates the pumping test to demonstrate little movement between the Niles Cone and San Franciquito Cone but does not conclude something similar between San Francisquito Cone and San Jose Plain to the south.

- Different hydraulic characteristics that may occur in the San Francisquito Cone do not preclude a hydrogeologic connection.

CONCEPT OF PROPORTIONAL BENEFIT

The Stanford comments also state that District pumping charges should be proportional to the magnitude of benefits. This issue has already been addressed in response to a similar comment made by Stanford on a memo describing the study methodology:

> Our research and interpretation of groundwater benefit zones established by other California agencies does not present examples of a "relative weighting" concept as described by the commenter. The relative benefit is likely to continuously change with distance from District activities, so defining zones based on a specified level of benefit would be arbitrary. The methodology includes evaluation of different types of benefits in order to assess the extent of benefit to the water budget from specific District activities. However, the different types of benefit will not be used to assess or weigh relative benefit. The zones will be drawn based on District activity that is improving the water budget of the shared resource for the area and on the premise that all groundwater users in the associated area should pay an equal share for the activity.

REFERENCES

Wentworth, C.M., R.C. Jachens, R.A. Williams, J.C. Tinsley, and R.T. Hanson, 2015, *Physical Subdivision and Description of the Water-Bearing Sediments of the Santa Clara Valley, California*, U.S. Geological Survey Scientific Investigations Report 2015-5017, April 6.

Sincerely,
MONTGOMERY & ASSOCIATES

Cameron Tana

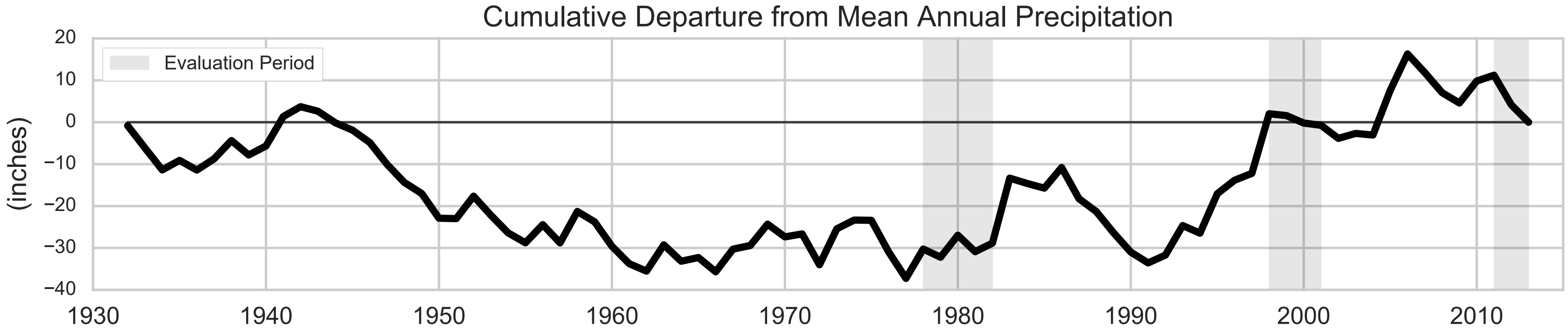
Cameron Tana, P.E.
Principal Hydrologist

Derrik Williams

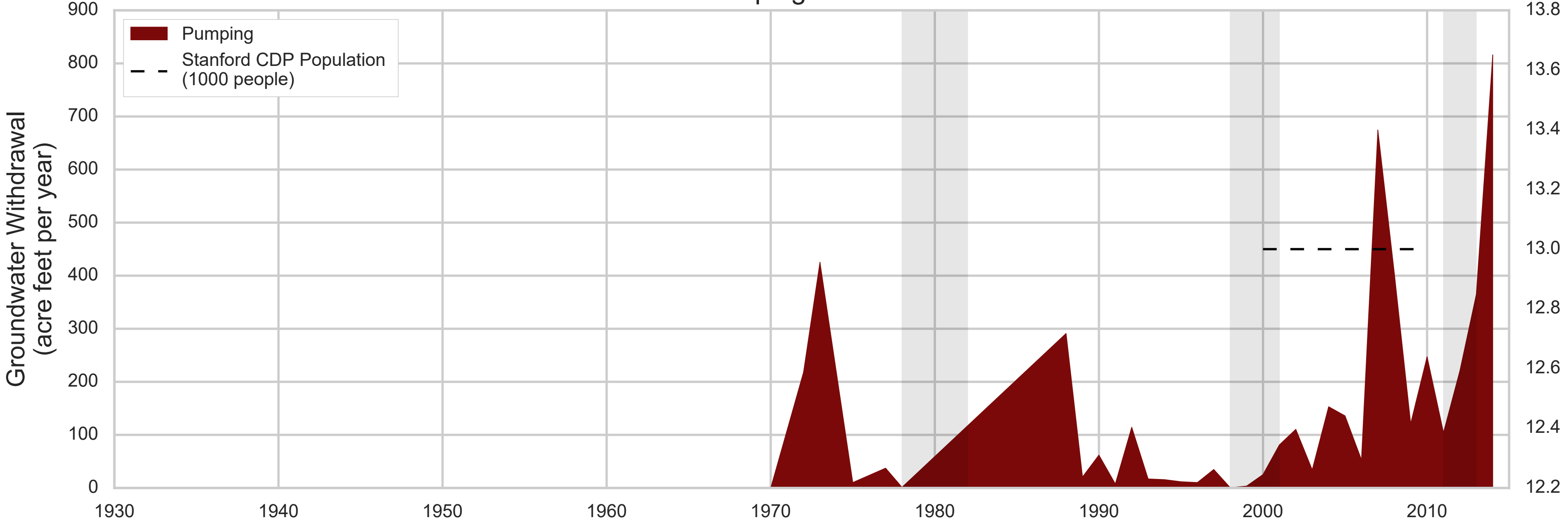
Derrik Williams. P.G., C. Hg.
Principal Hydrogeologist

Pumping Area: Stanford: RWS
Activity: Santa Clara Subbasin Managed Recharge
Groundwater Level Data from: Monitored Pumping Wells

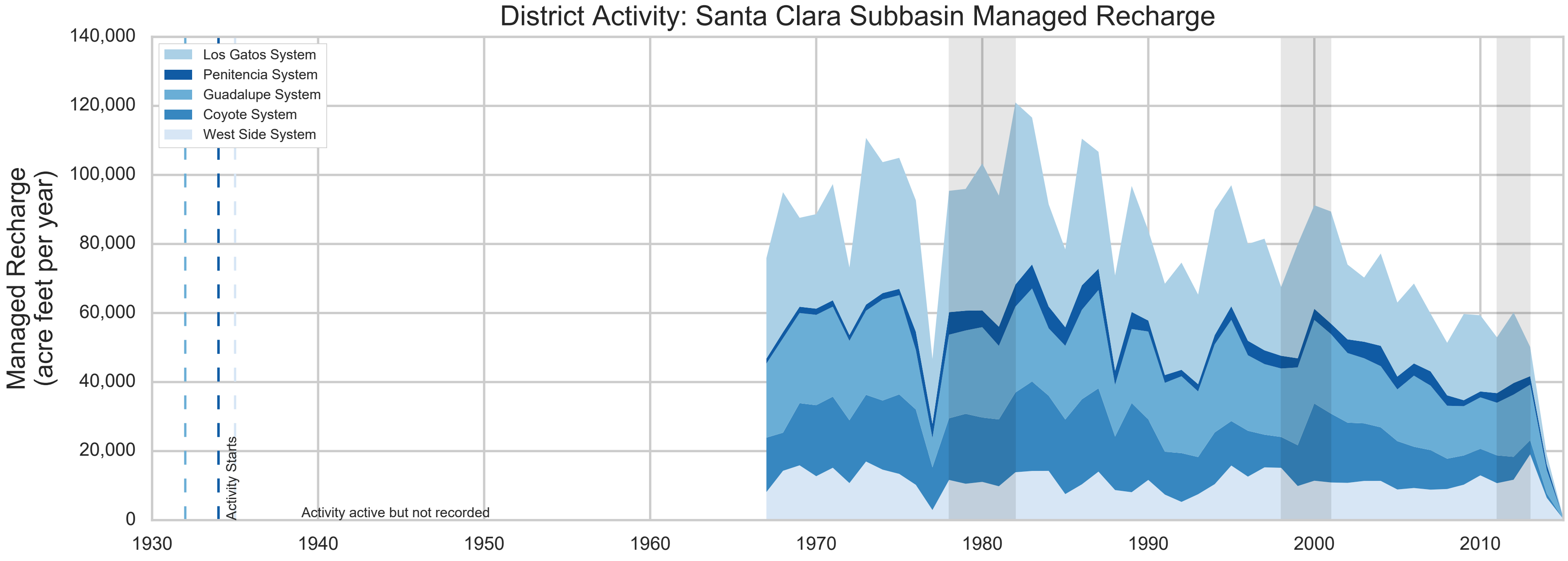
Cumulative Departure from Mean Annual Precipitation



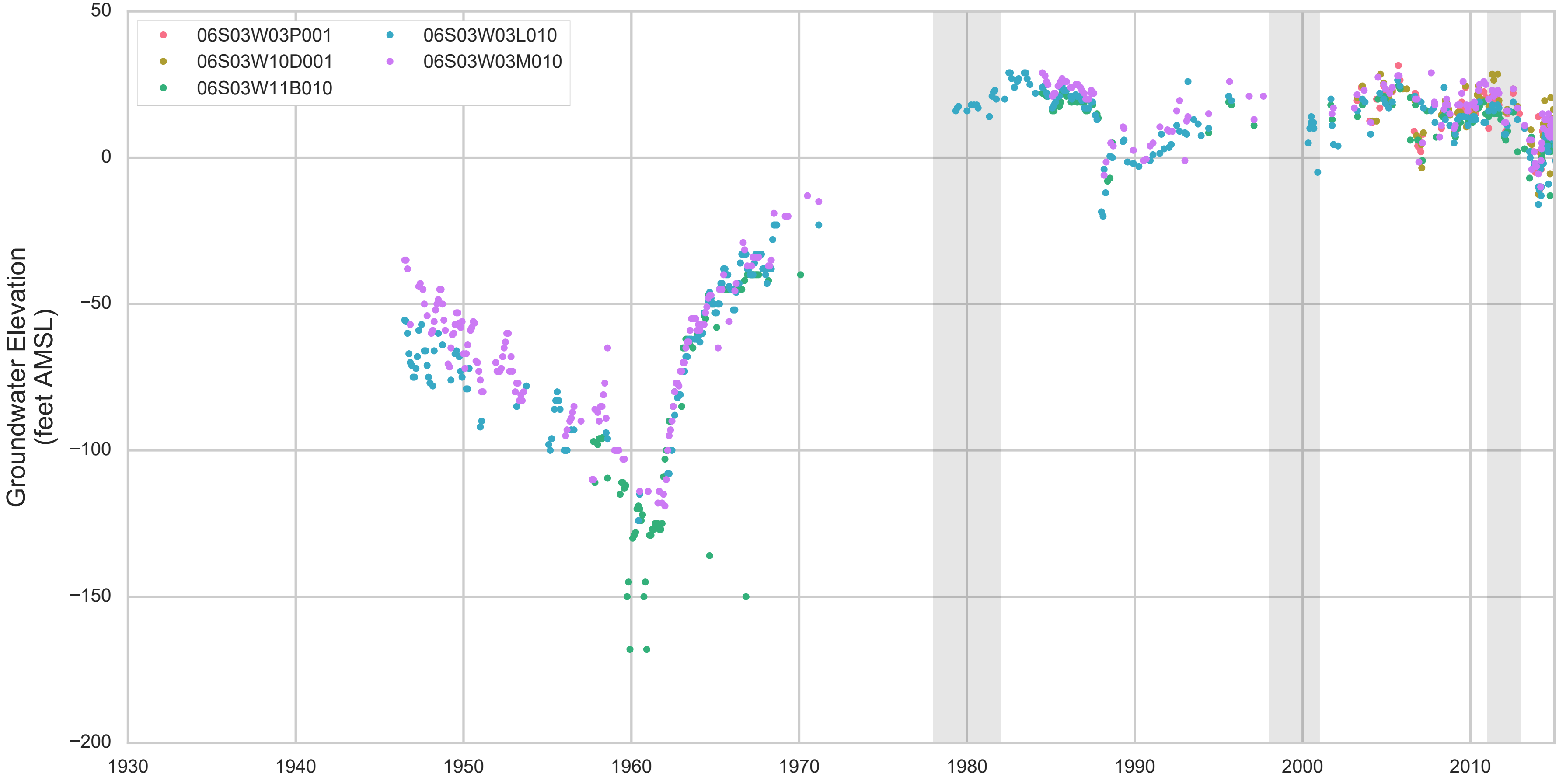
Groundwater Pumping in Stanford: RWS Area



District Activity: Santa Clara Subbasin Managed Recharge

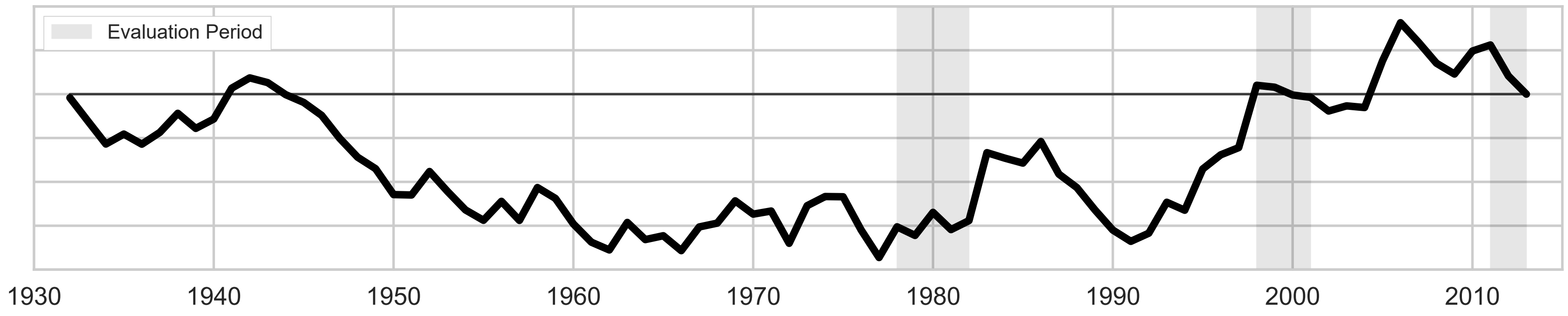


Observed Groundwater Elevations in Stanford: RWS Area

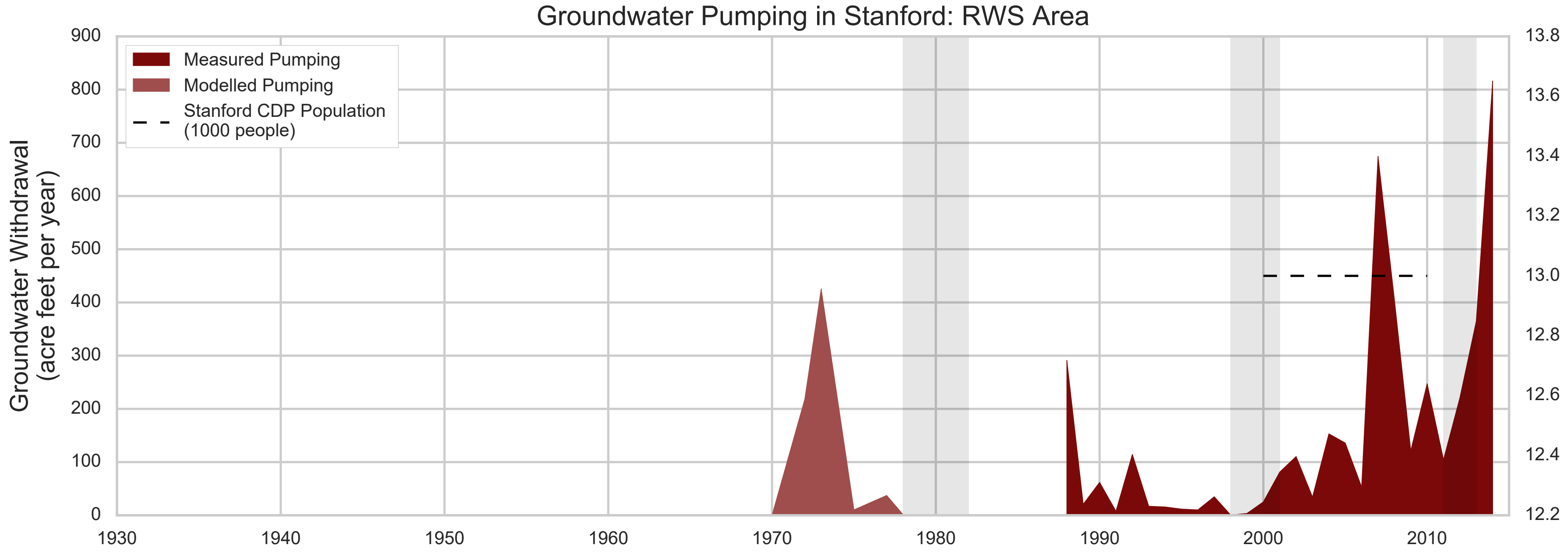


Monitored Pumping Wells well: 06S03W03P001
Minimum distance from activity: 32986 feet

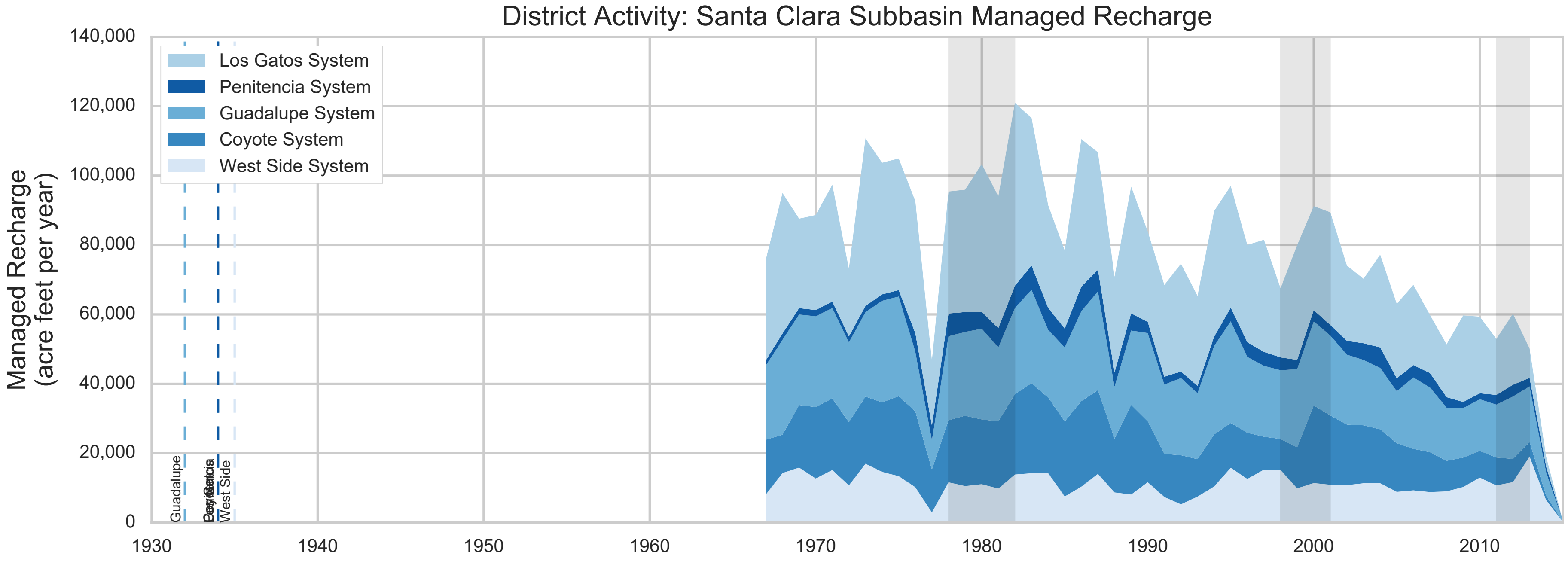
Cumulative Departure from Mean Annual Precipitation



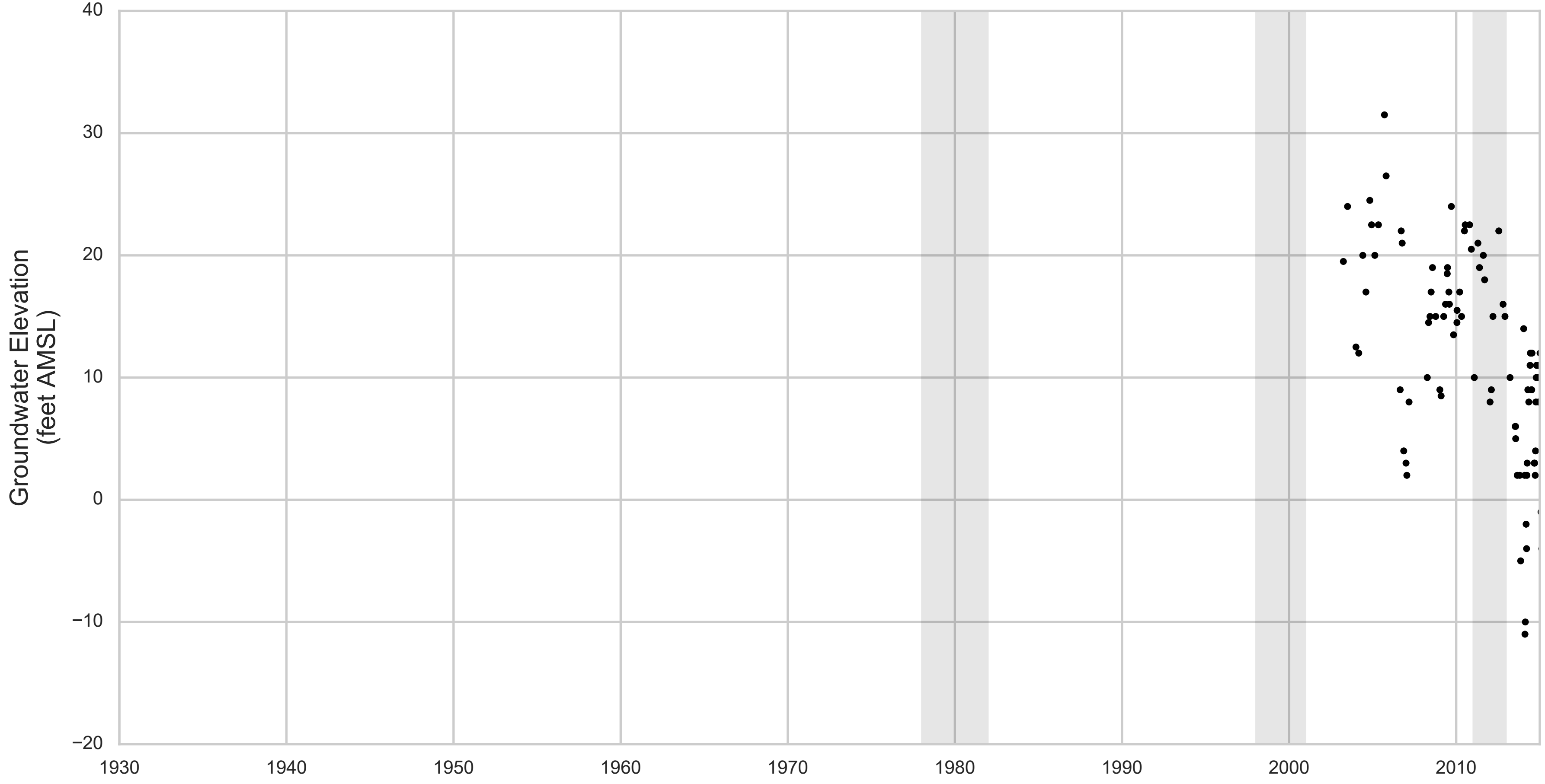
Groundwater Pumping in Stanford: RWS Area



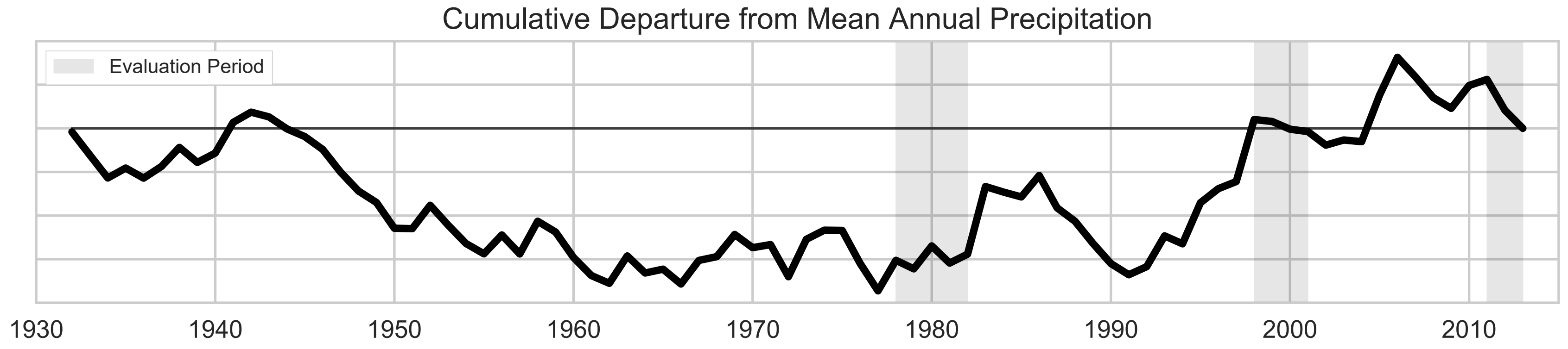
District Activity: Santa Clara Subbasin Managed Recharge

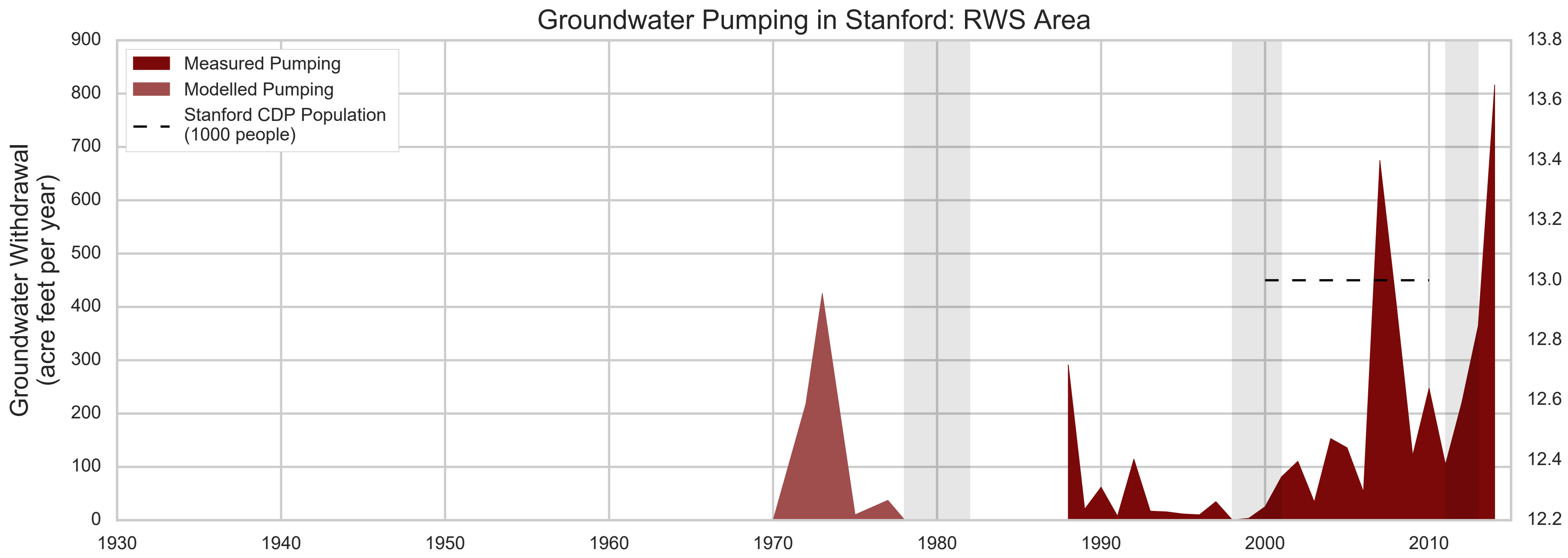


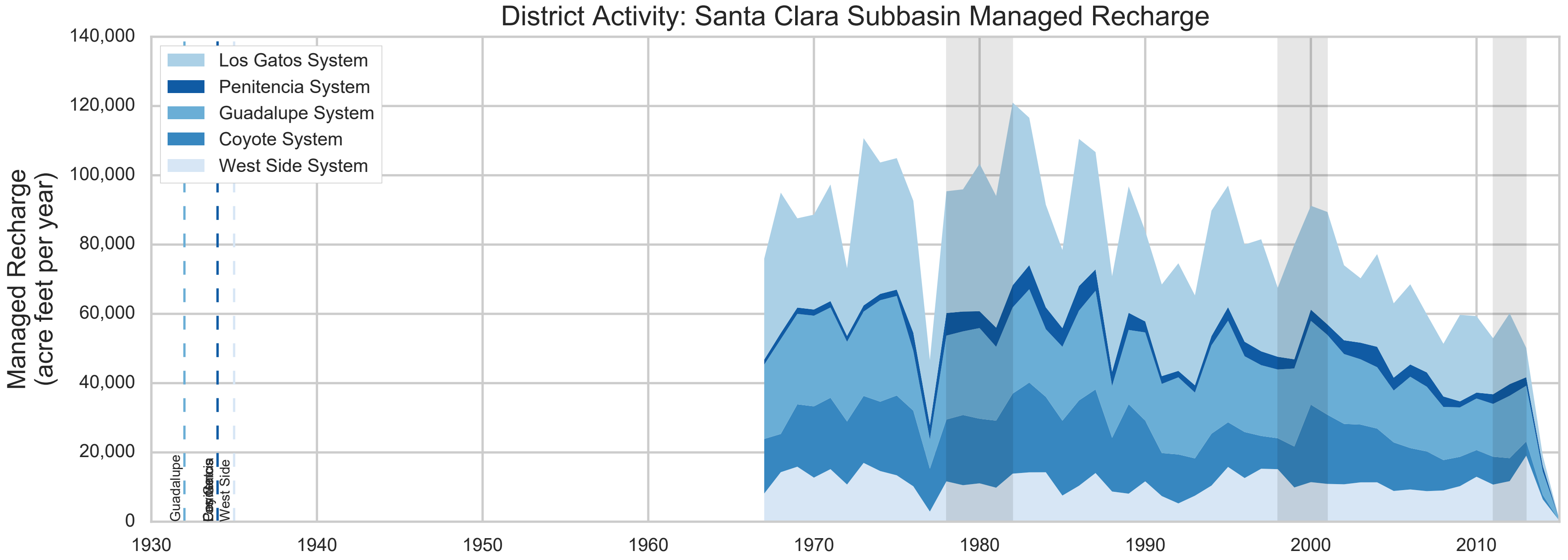
Observed Groundwater Elevation: 06S03W03P001

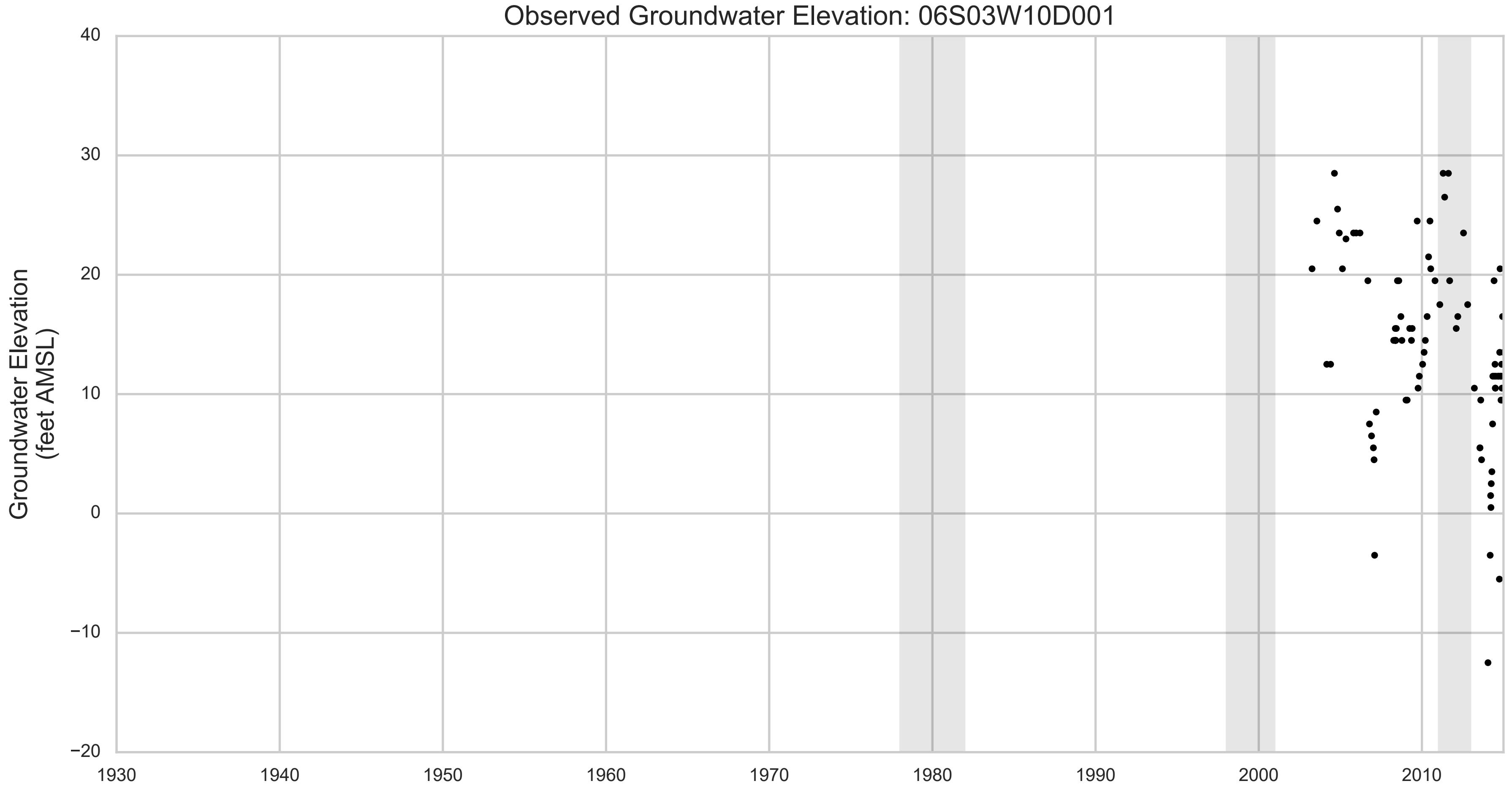


Monitored Pumping Wells well: 06S03W10D001
Minimum distance from activity: 33663 feet

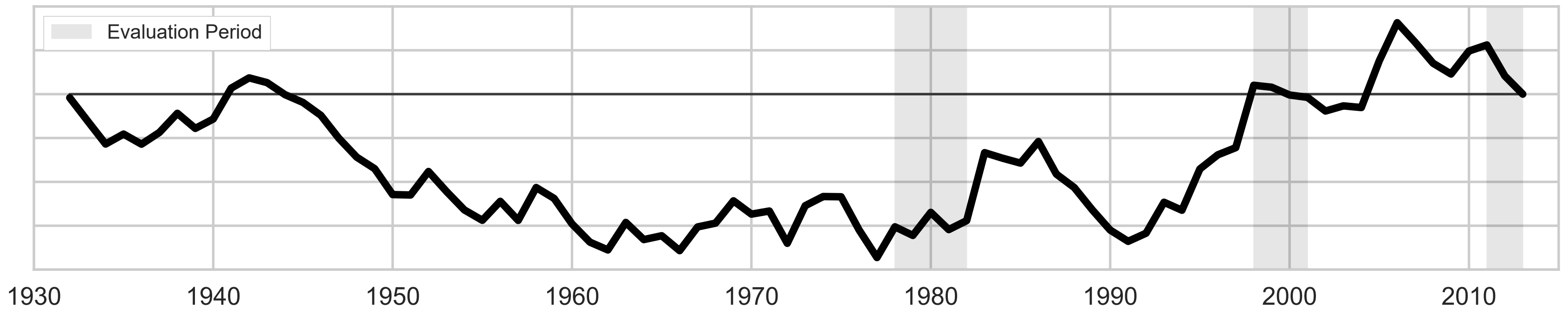

Cumulative Departure from Mean Annual Precipitation


Groundwater Pumping in Stanford: RWS Area

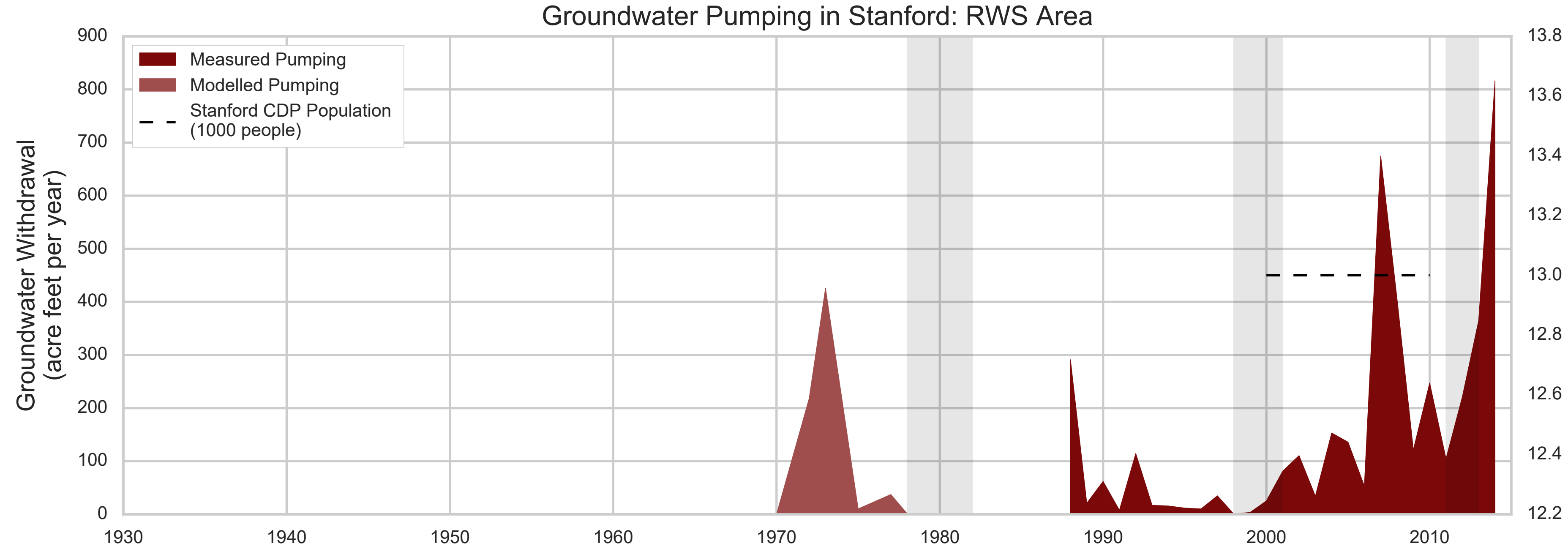

District Activity: Santa Clara Subbasin Managed Recharge


Observed Groundwater Elevation: 06S03W10D001

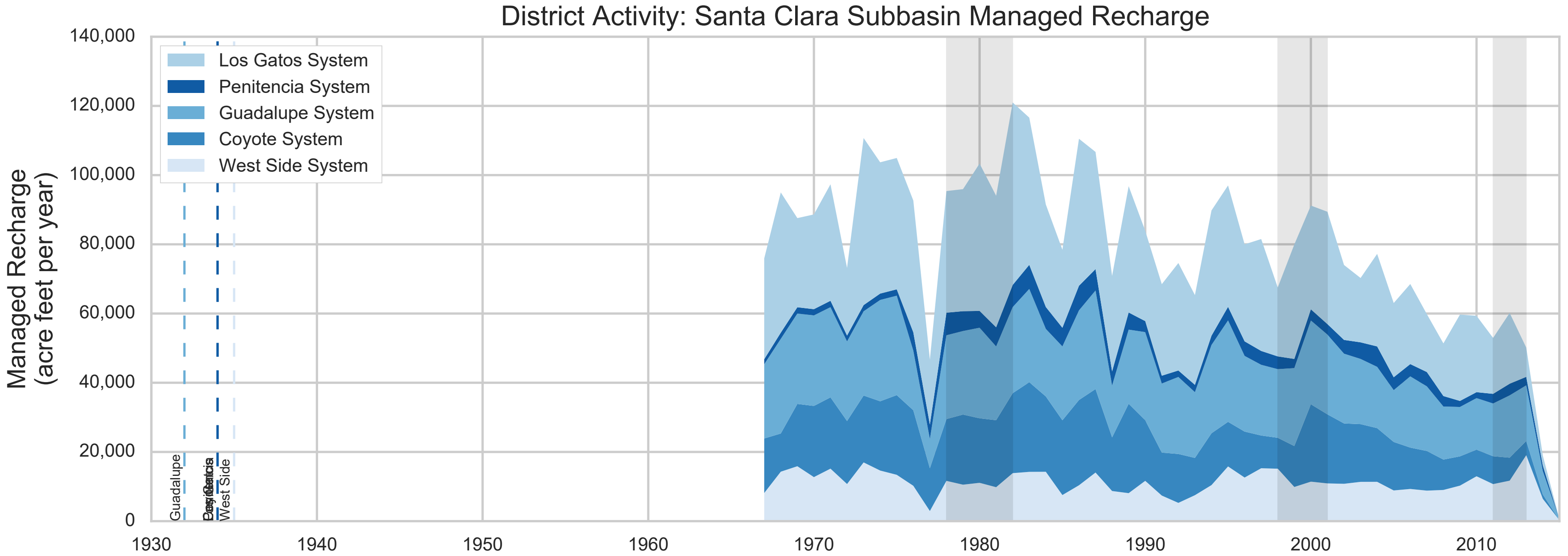
Monitored Pumping Wells well: 06S03W11B010
Minimum distance from activity: 25347 feet



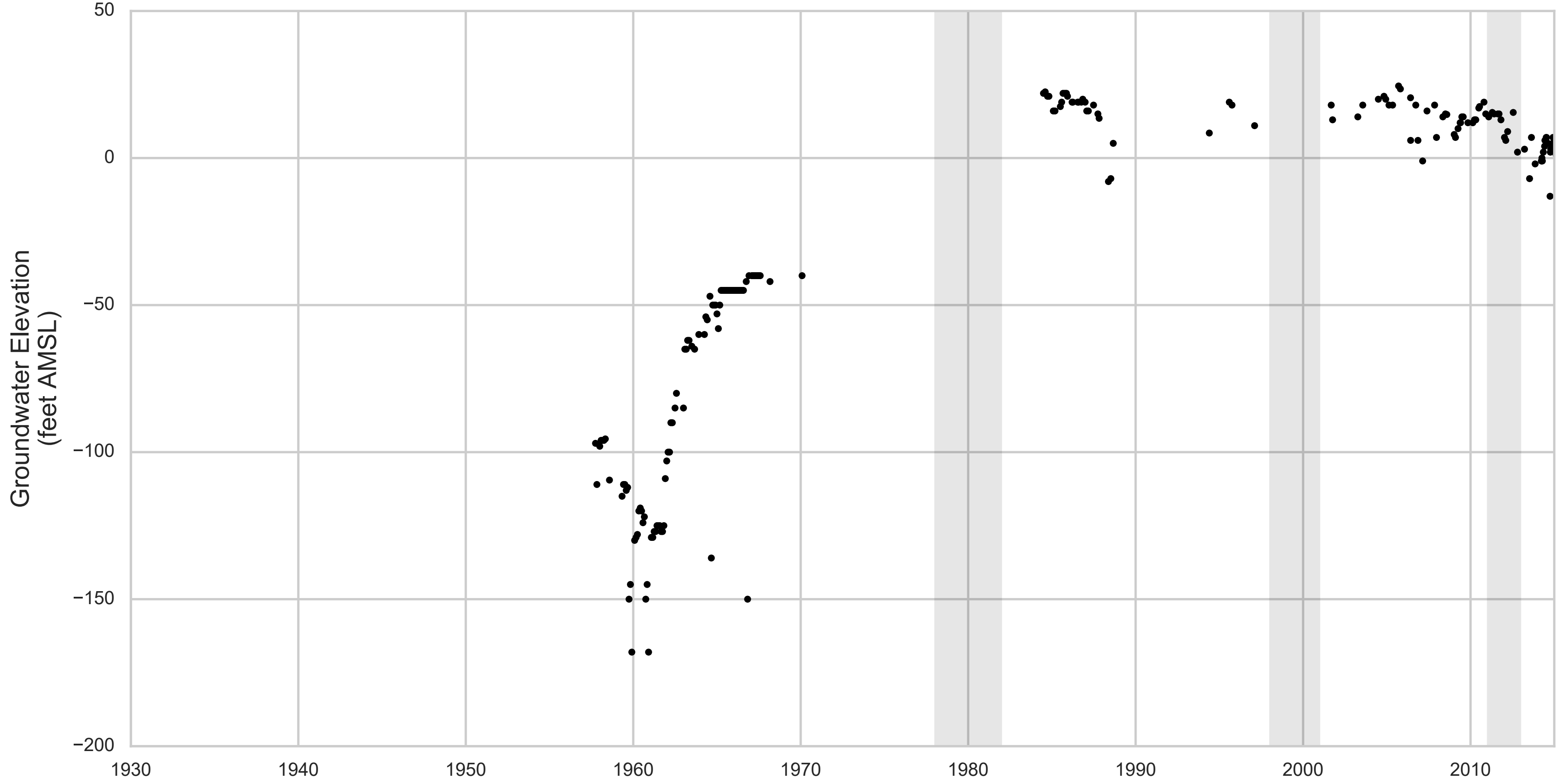
Cumulative Departure from Mean Annual Precipitation



Groundwater Pumping in Stanford: RWS Area

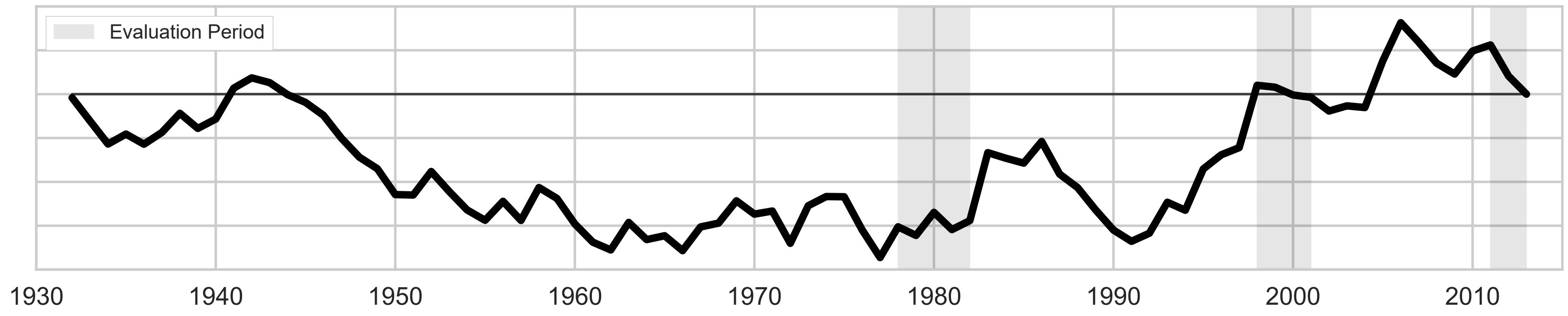


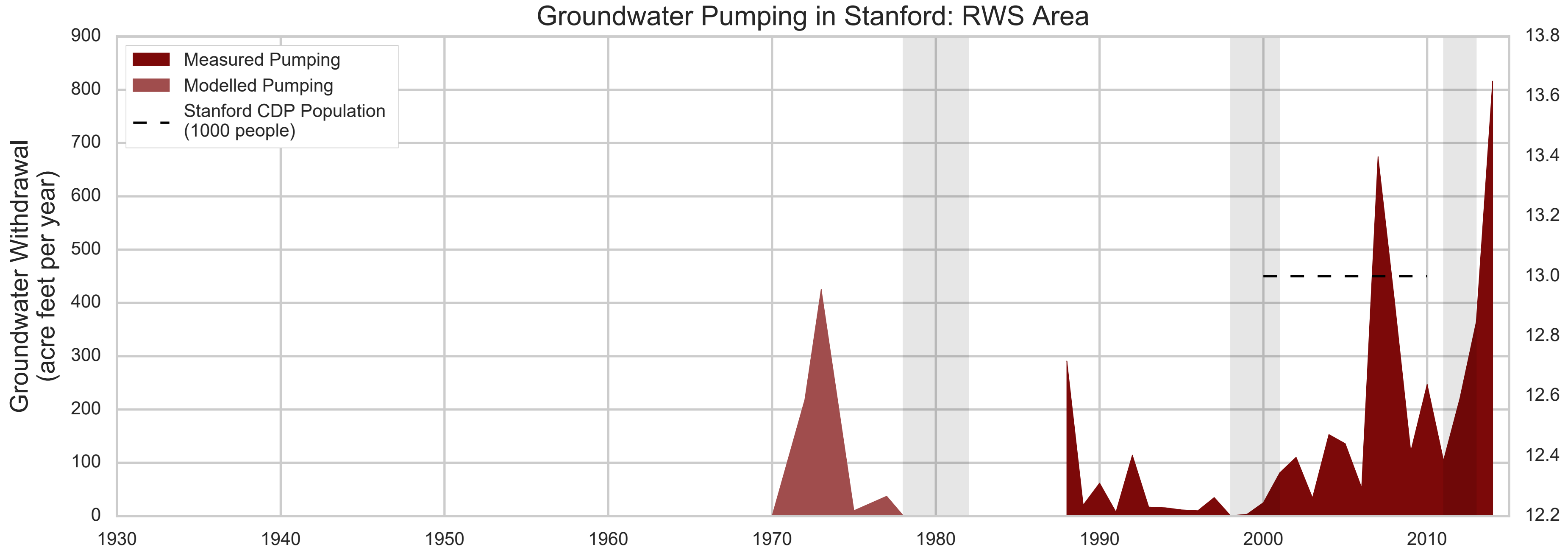
District Activity: Santa Clara Subbasin Managed Recharge

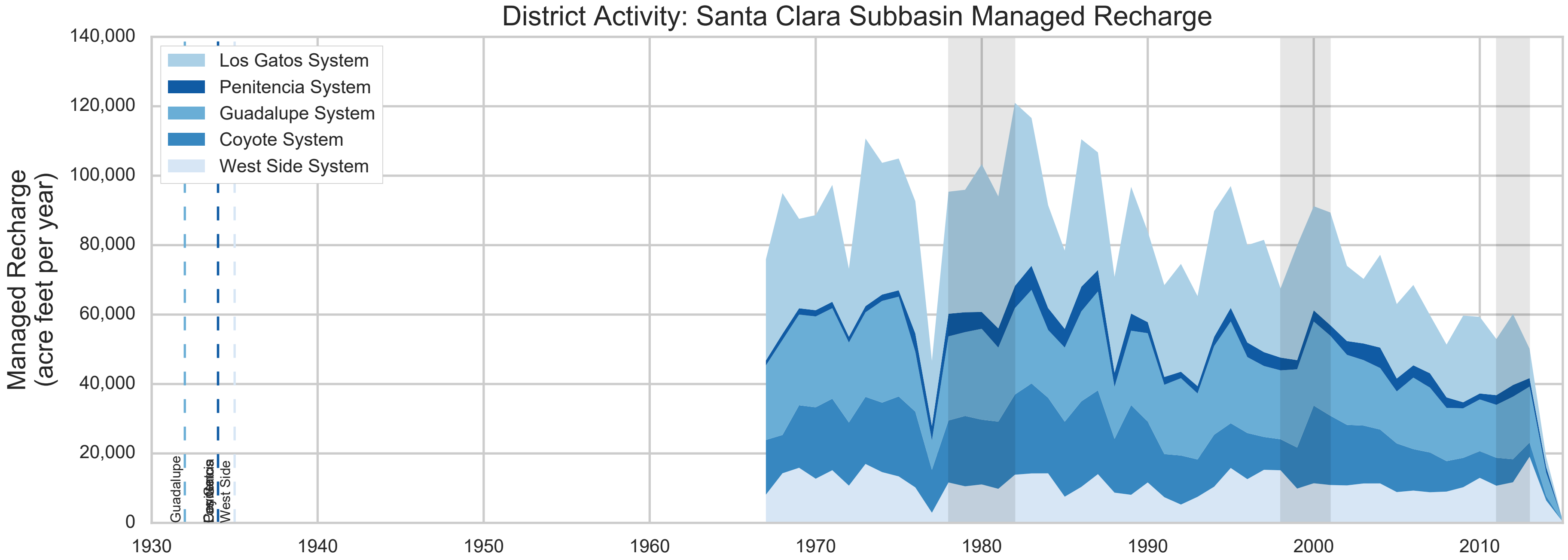


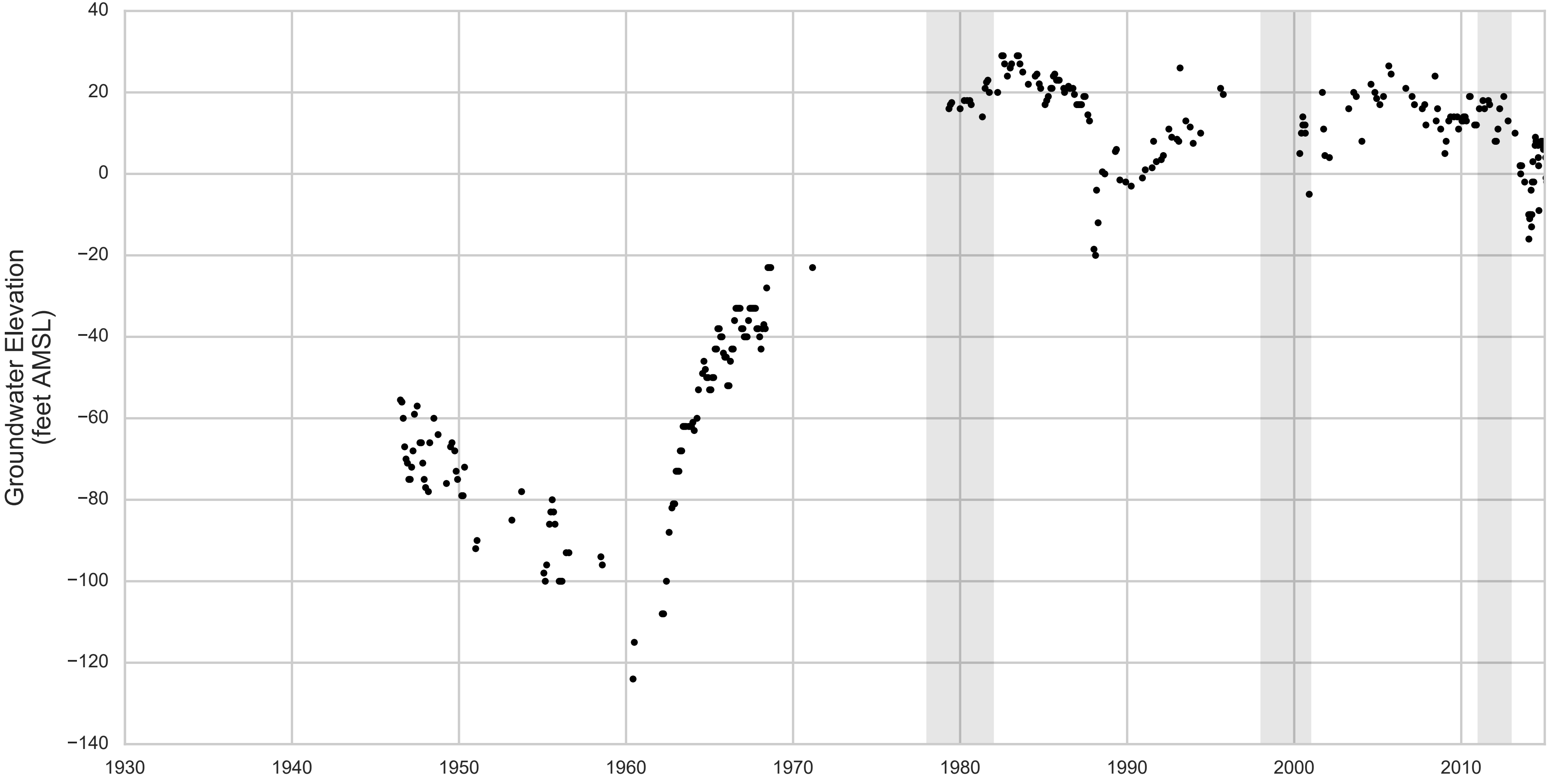
Observed Groundwater Elevation: 06S03W11B010

Monitored Pumping Wells well: 06S03W03L010
Minimum distance from activity: 31805 feet


Cumulative Departure from Mean Annual Precipitation

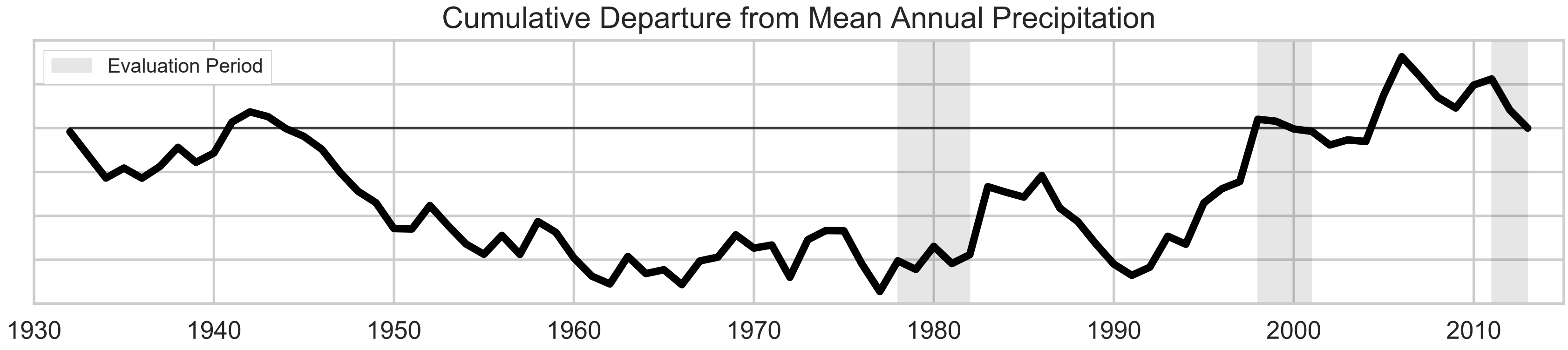

Groundwater Pumping in Stanford: RWS Area


District Activity: Santa Clara Subbasin Managed Recharge

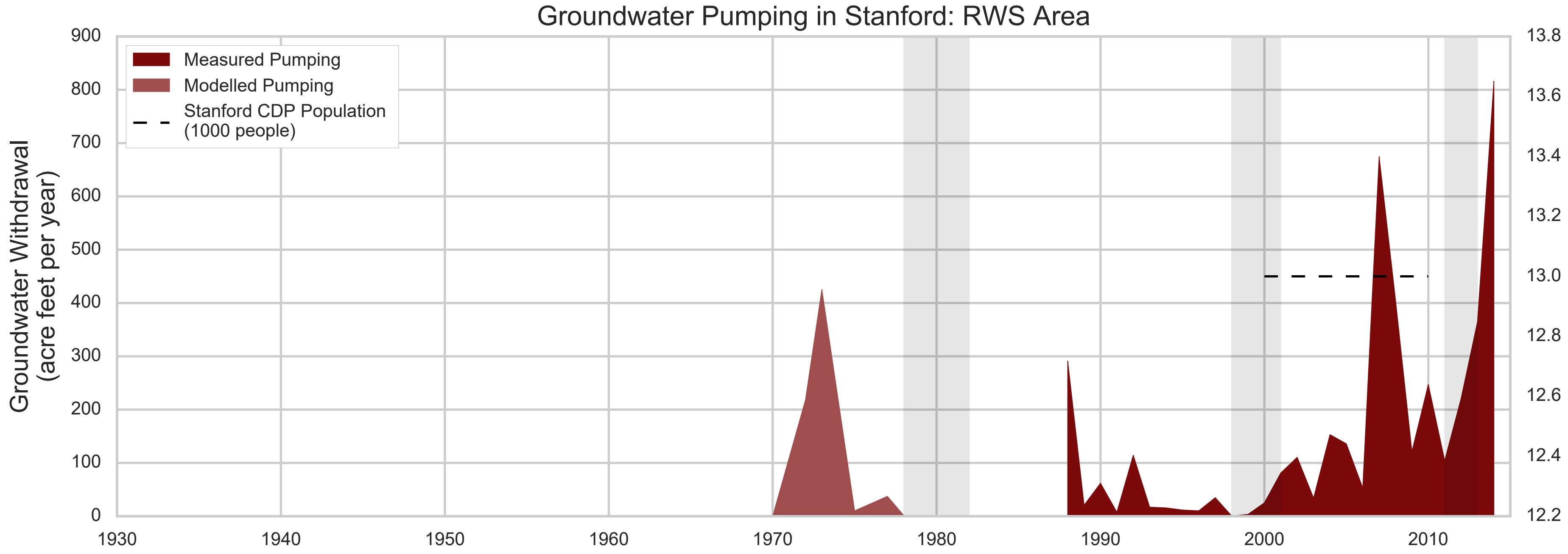

Observed Groundwater Elevation: 06S03W03L010

Monitored Pumping Wells well: 06S03W03M010
Minimum distance from activity: 32992 feet

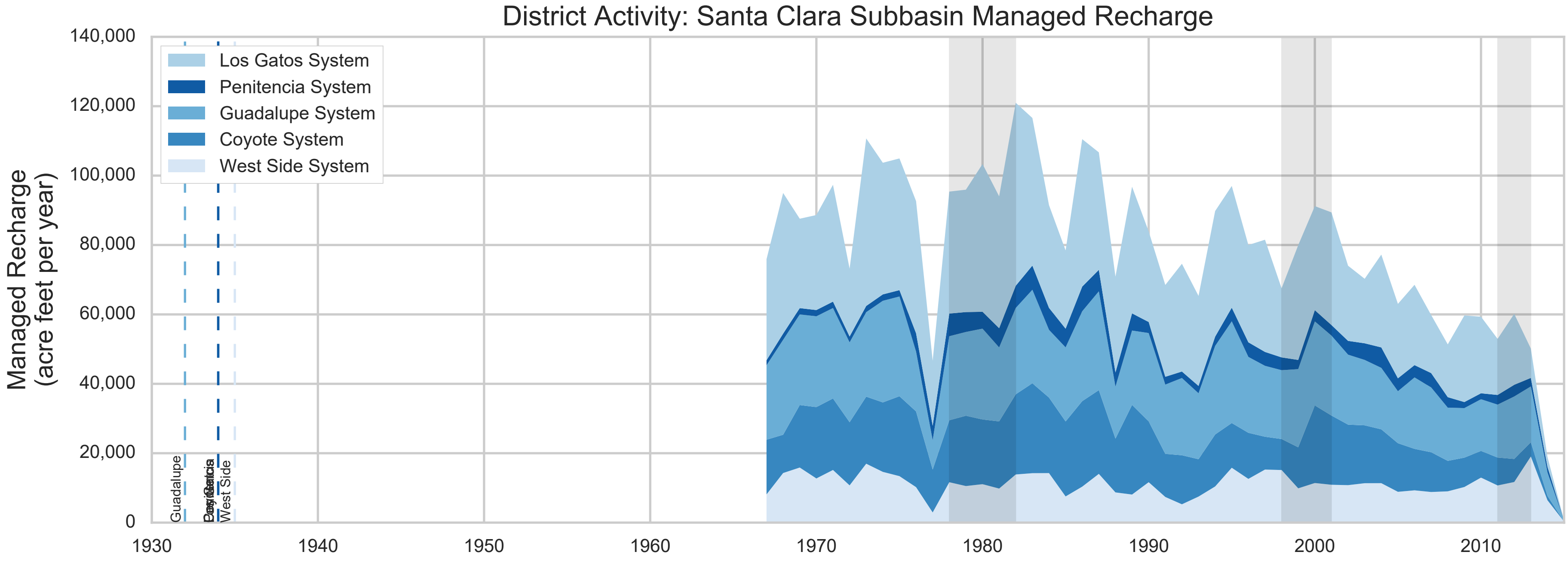
Cumulative Departure from Mean Annual Precipitation



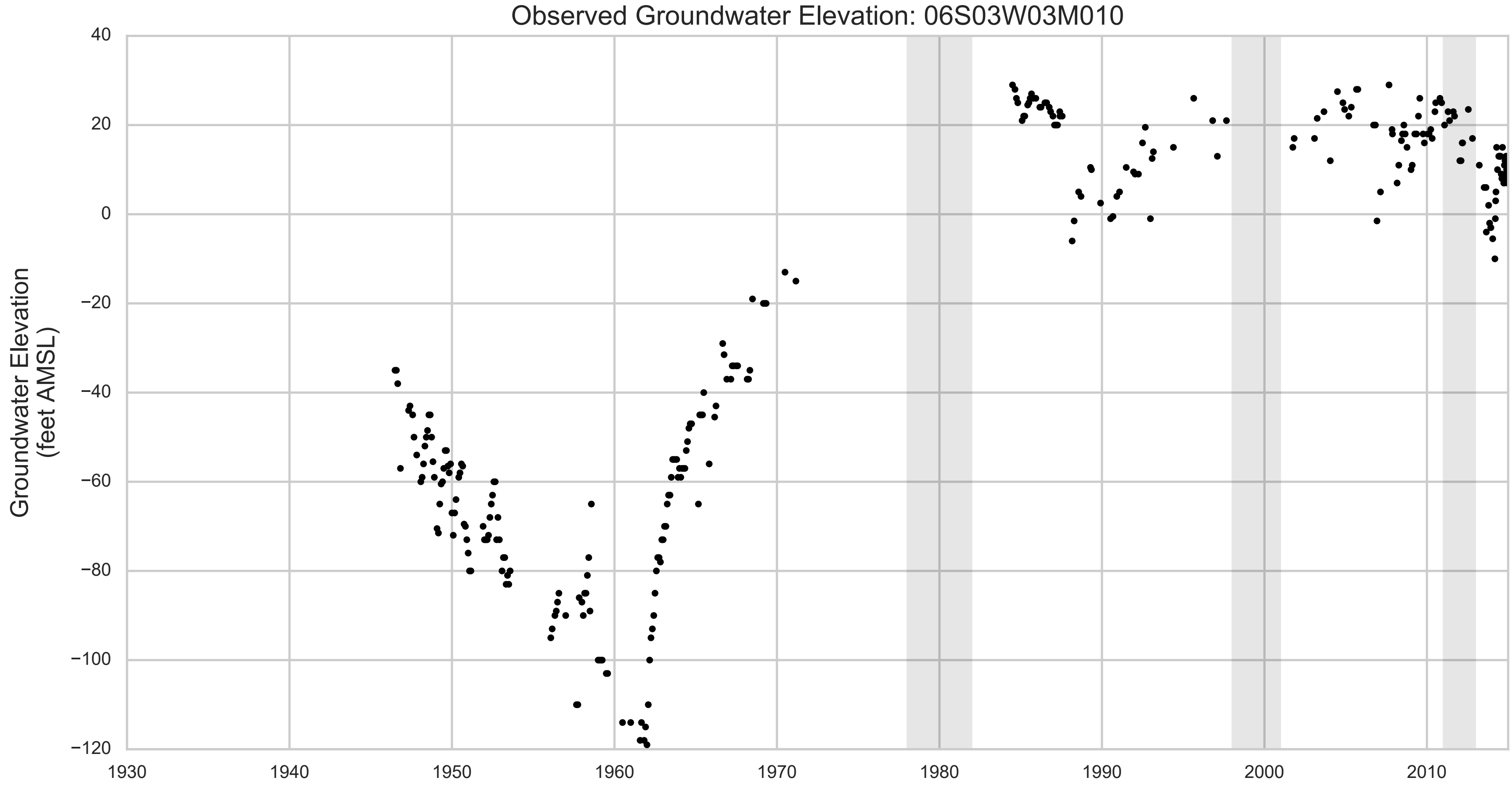
Groundwater Pumping in Stanford: RWS Area



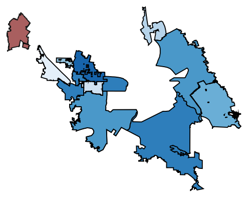
District Activity: Santa Clara Subbasin Managed Recharge



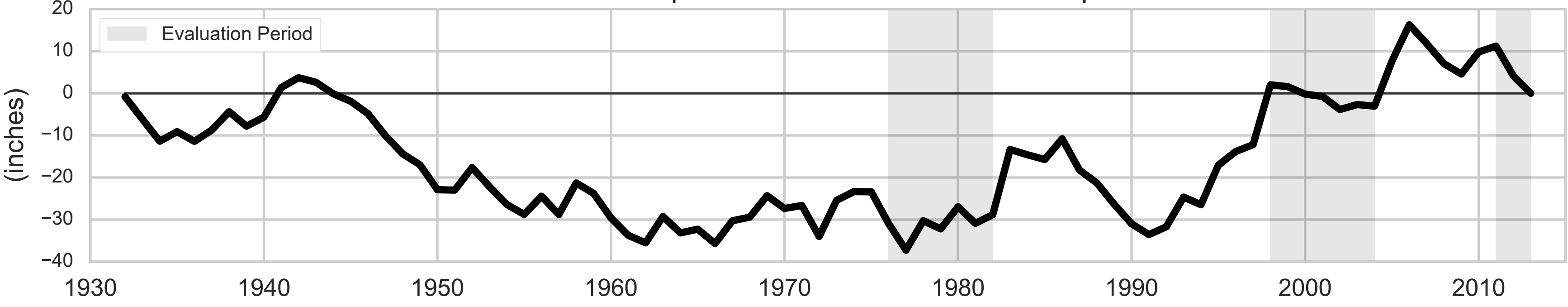
Observed Groundwater Elevation: 06S03W03M010



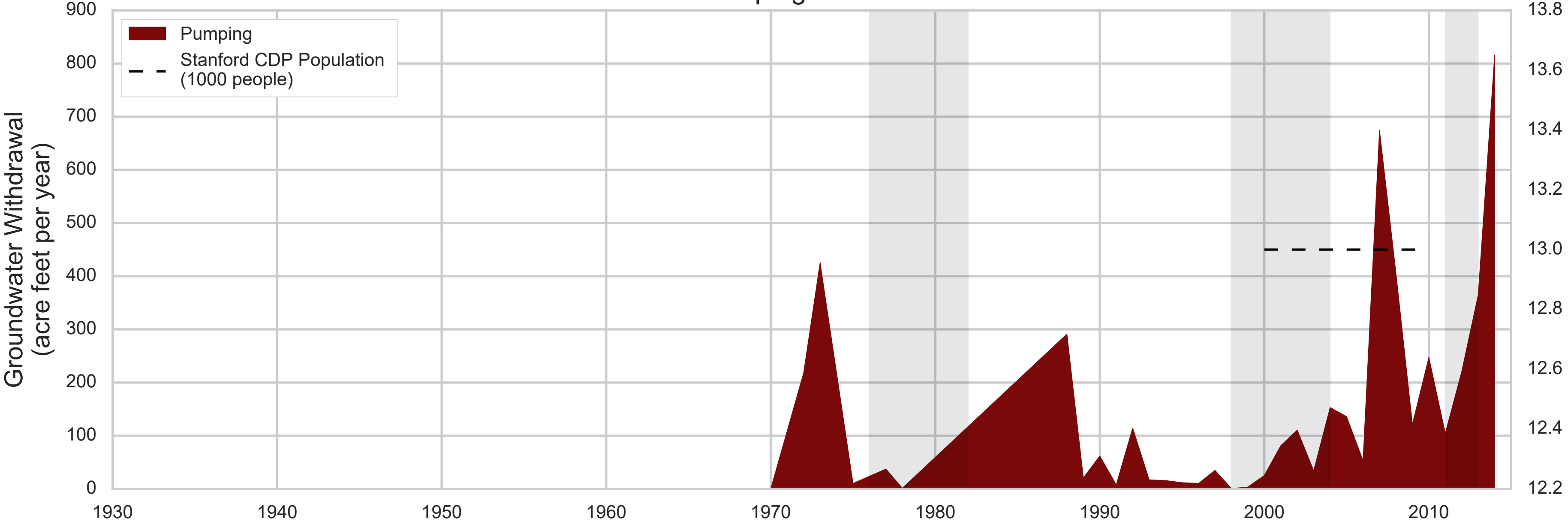
Pumping Area: Stanford: RWS
Activity: Treated Water Delivery
Groundwater Level Data from: Monitored Pumping Wells



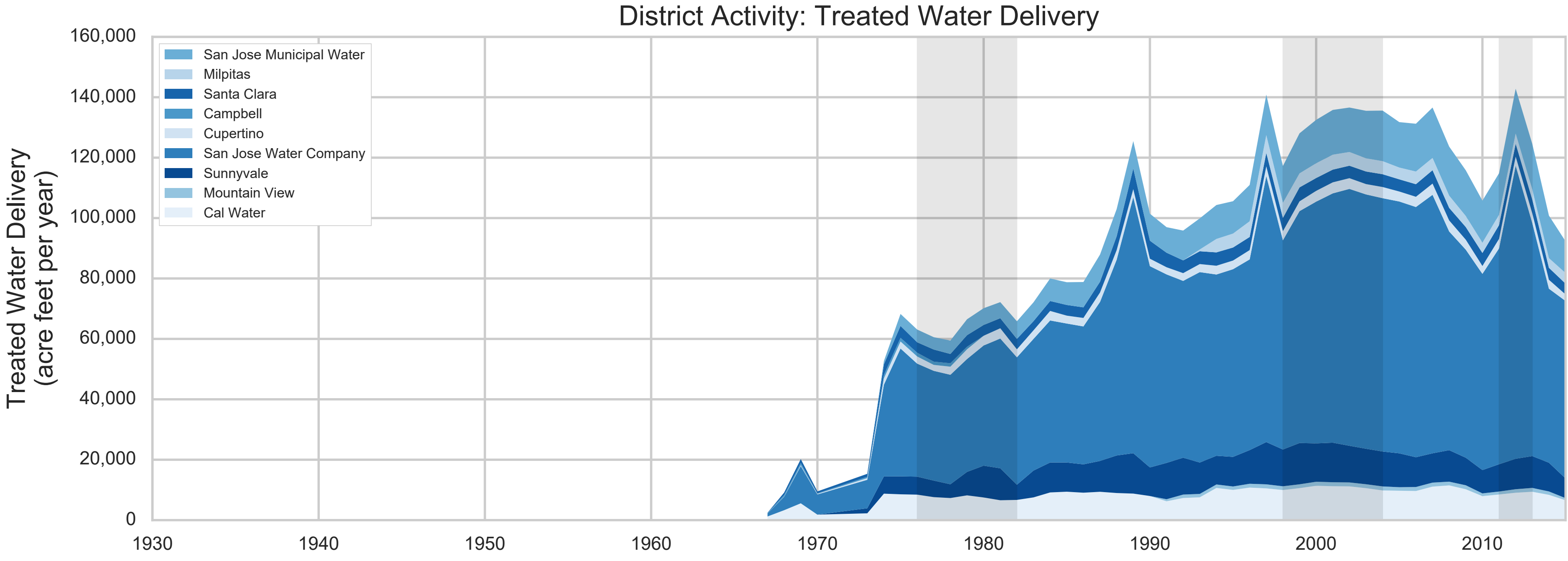
Cumulative Departure from Mean Annual Precipitation



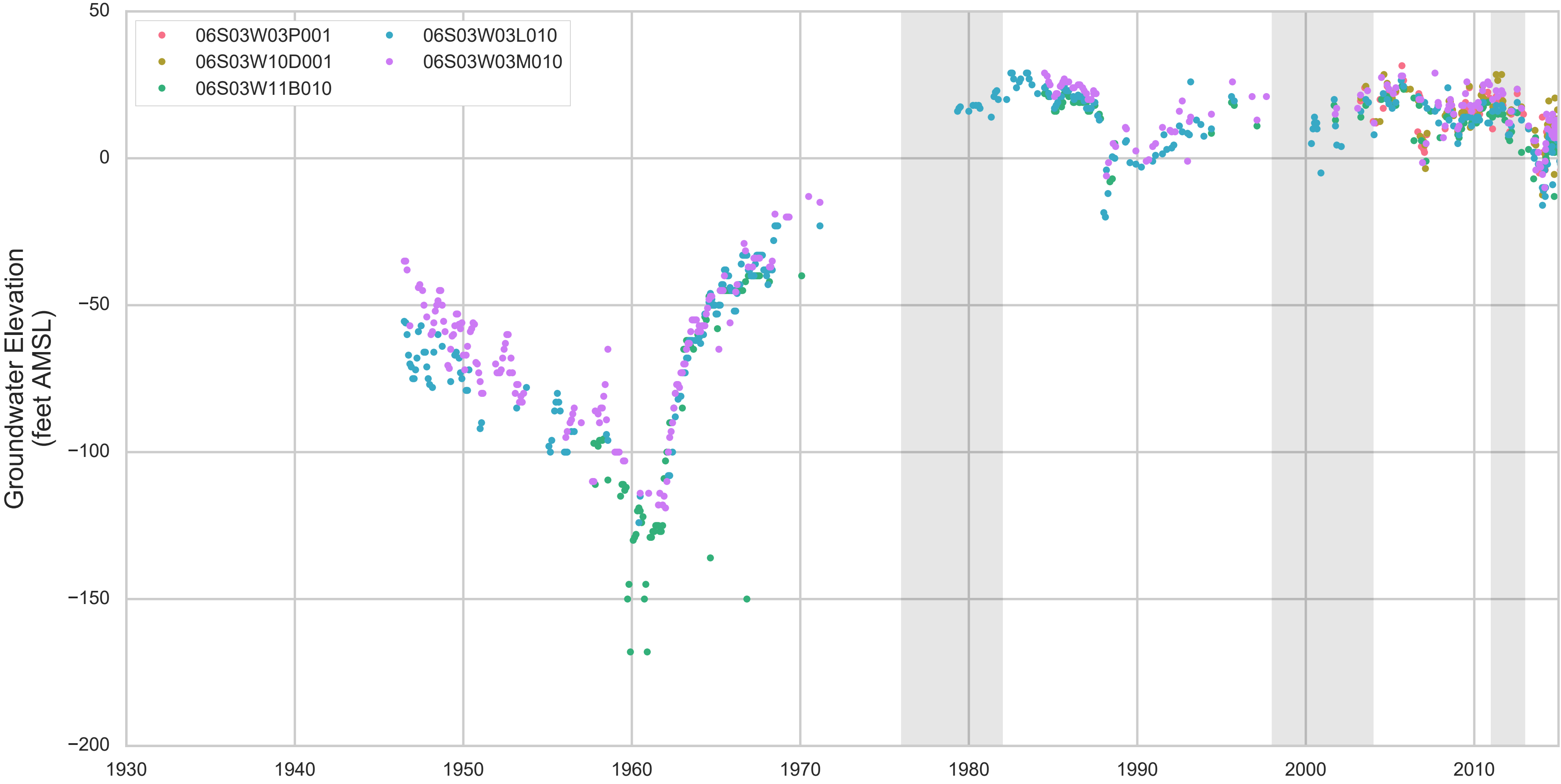
Groundwater Pumping in Stanford: RWS Area



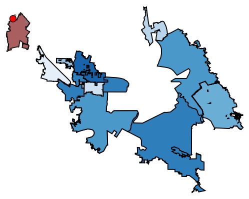
District Activity: Treated Water Delivery

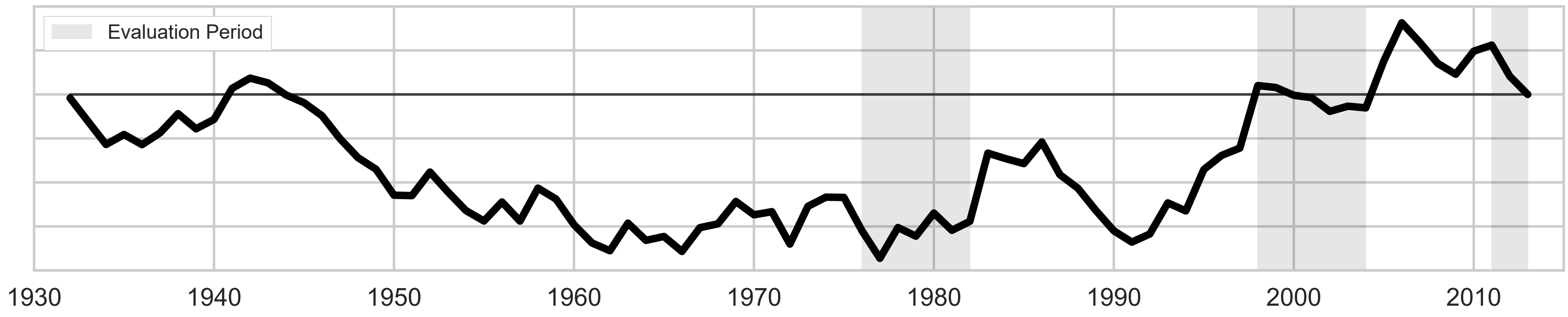


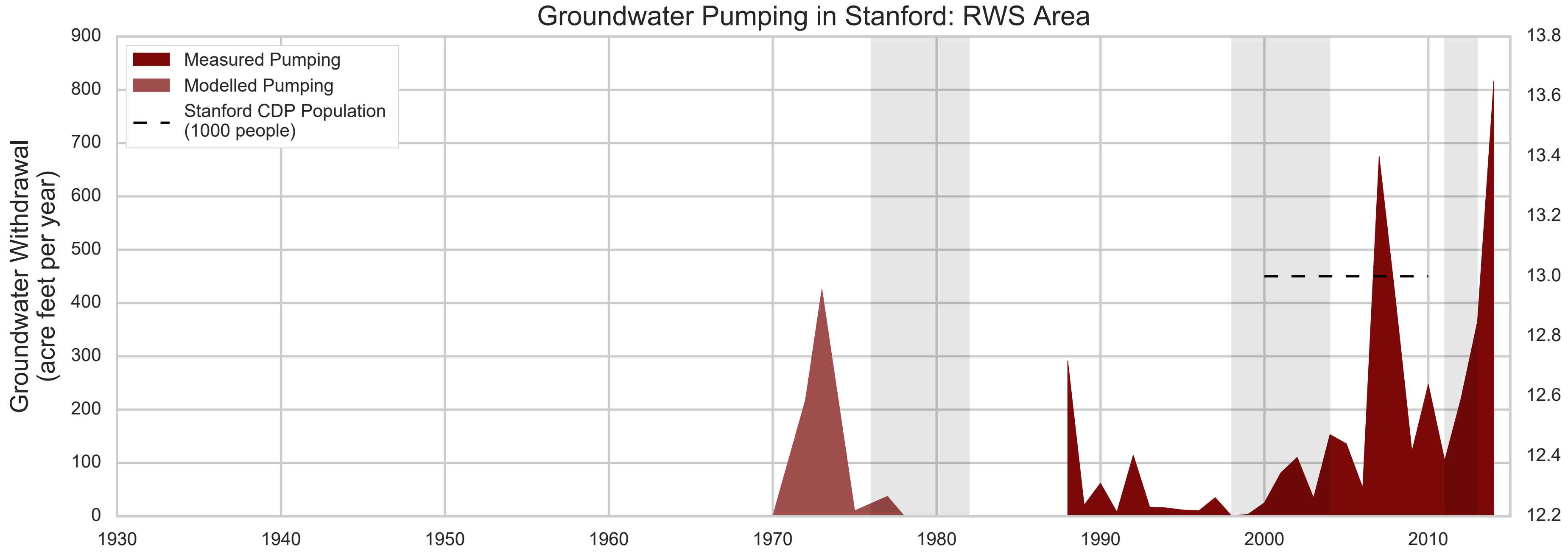
Observed Groundwater Elevations in Stanford: RWS Area

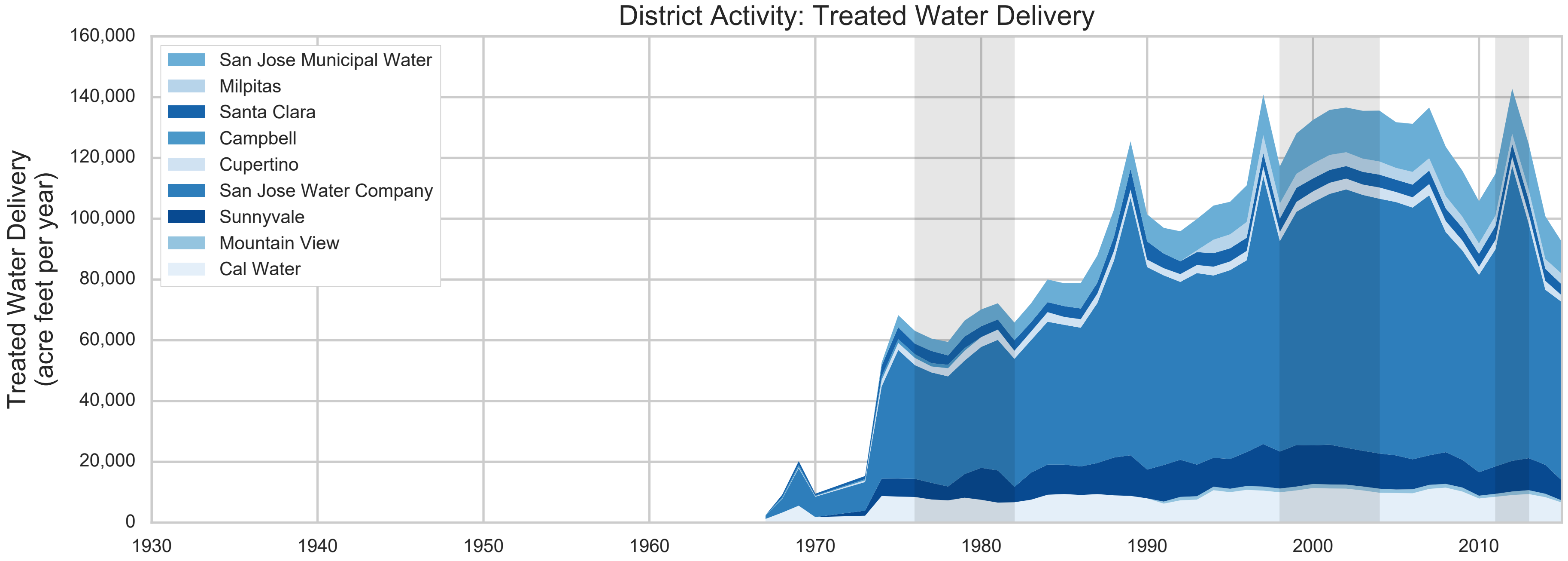


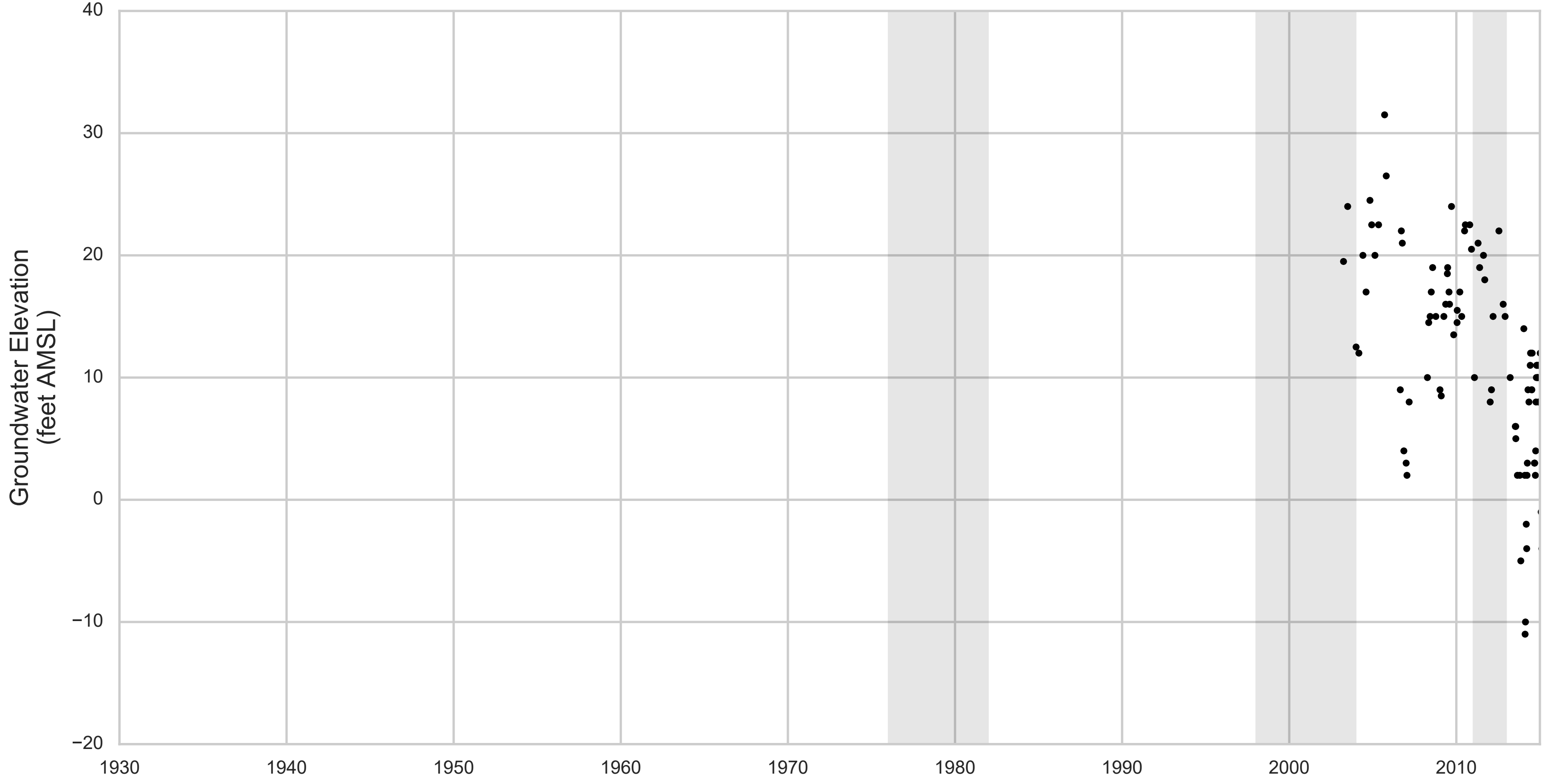
Monitored Pumping Wells well: 06S03W03P001
Minimum distance from activity: 21139 feet



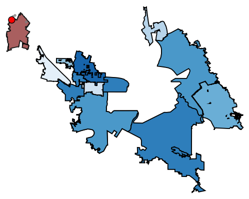

Cumulative Departure from Mean Annual Precipitation

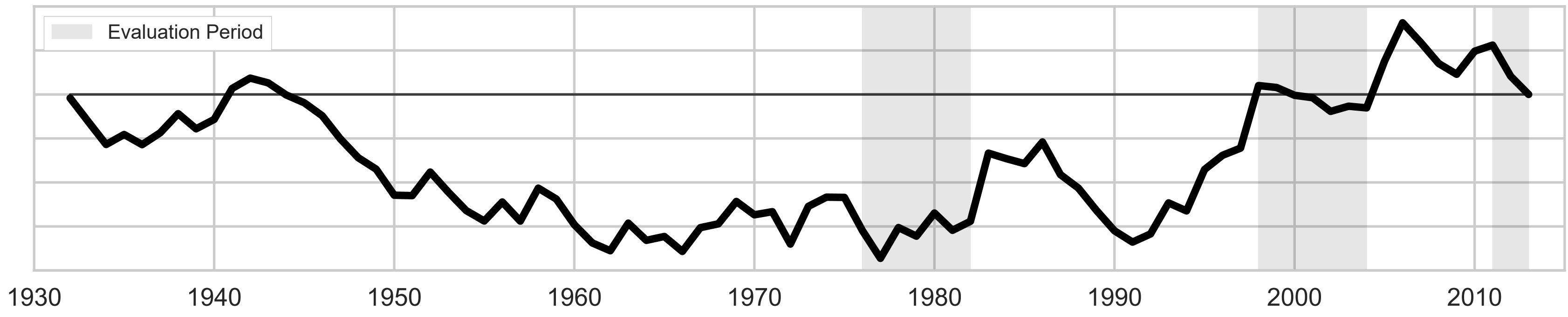

Groundwater Pumping in Stanford: RWS Area

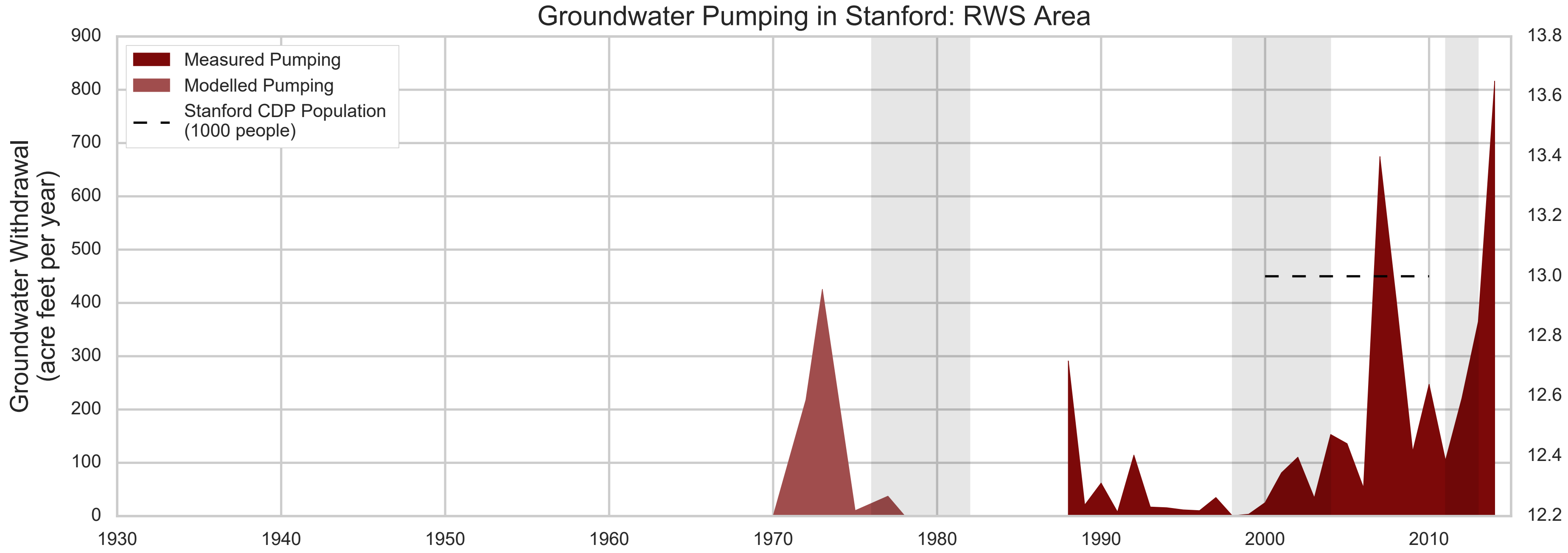

District Activity: Treated Water Delivery

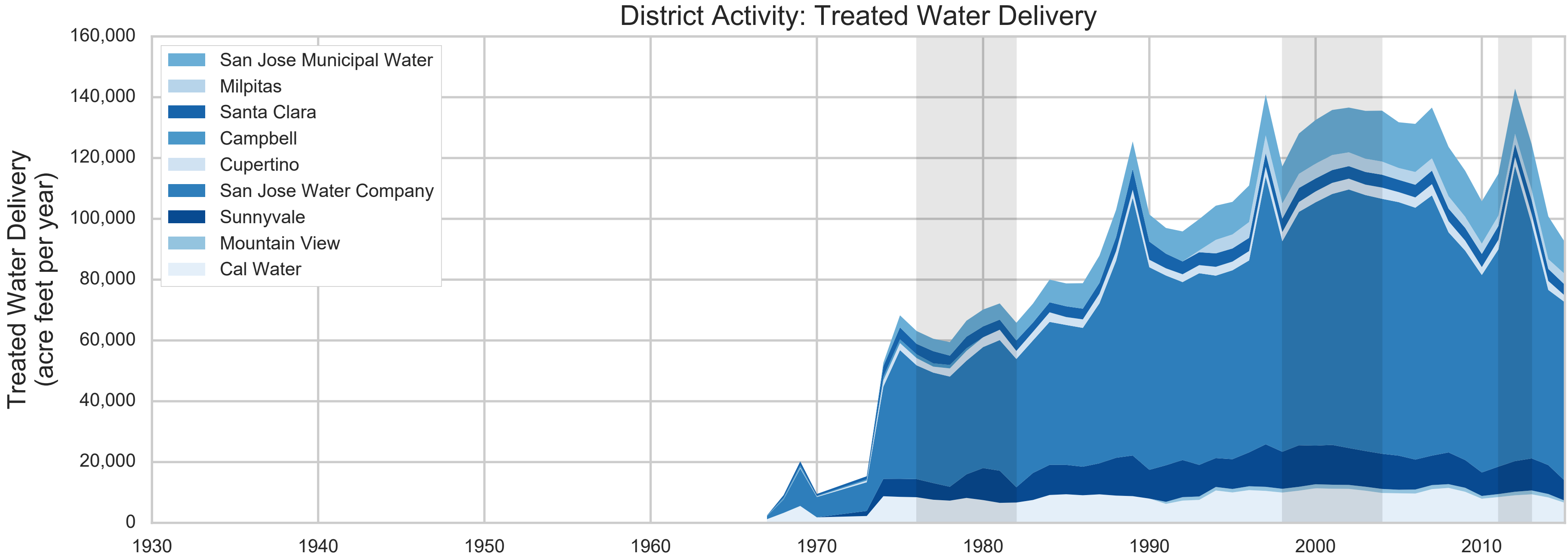

Observed Groundwater Elevation: 06S03W03P001

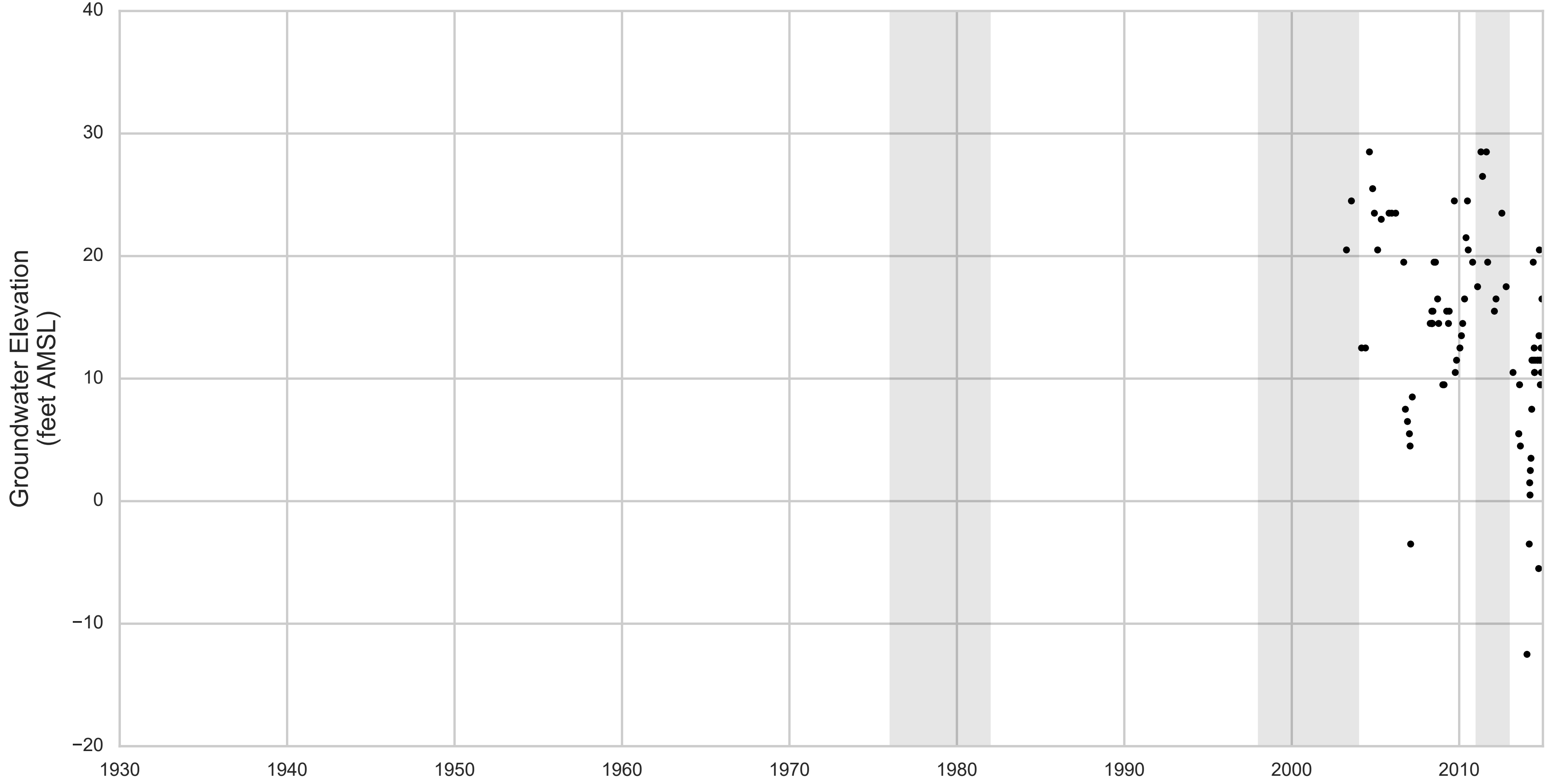
Monitored Pumping Wells well: 06S03W10D001
Minimum distance from activity: 21181 feet



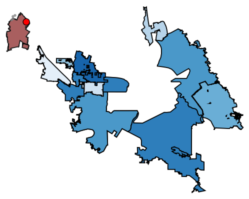

Cumulative Departure from Mean Annual Precipitation

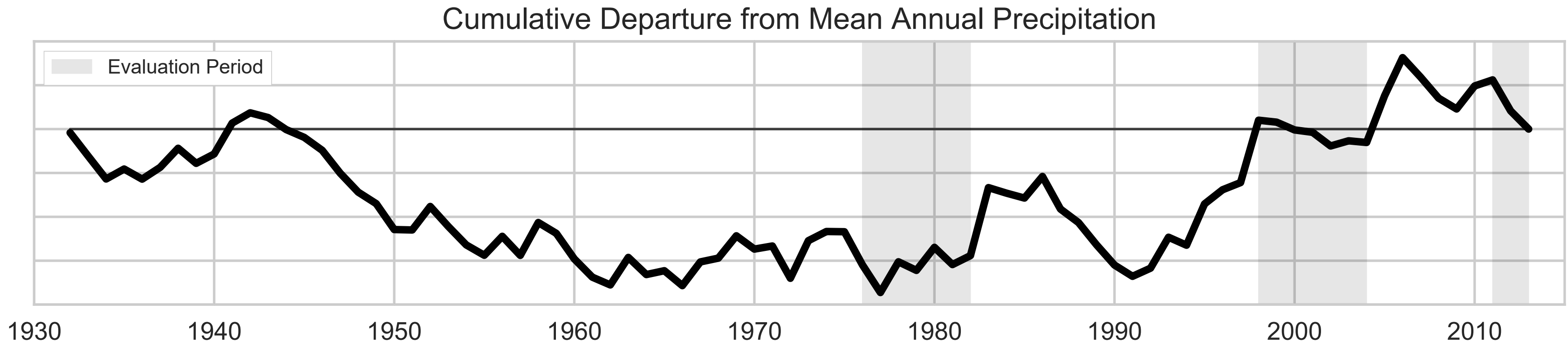

Groundwater Pumping in Stanford: RWS Area

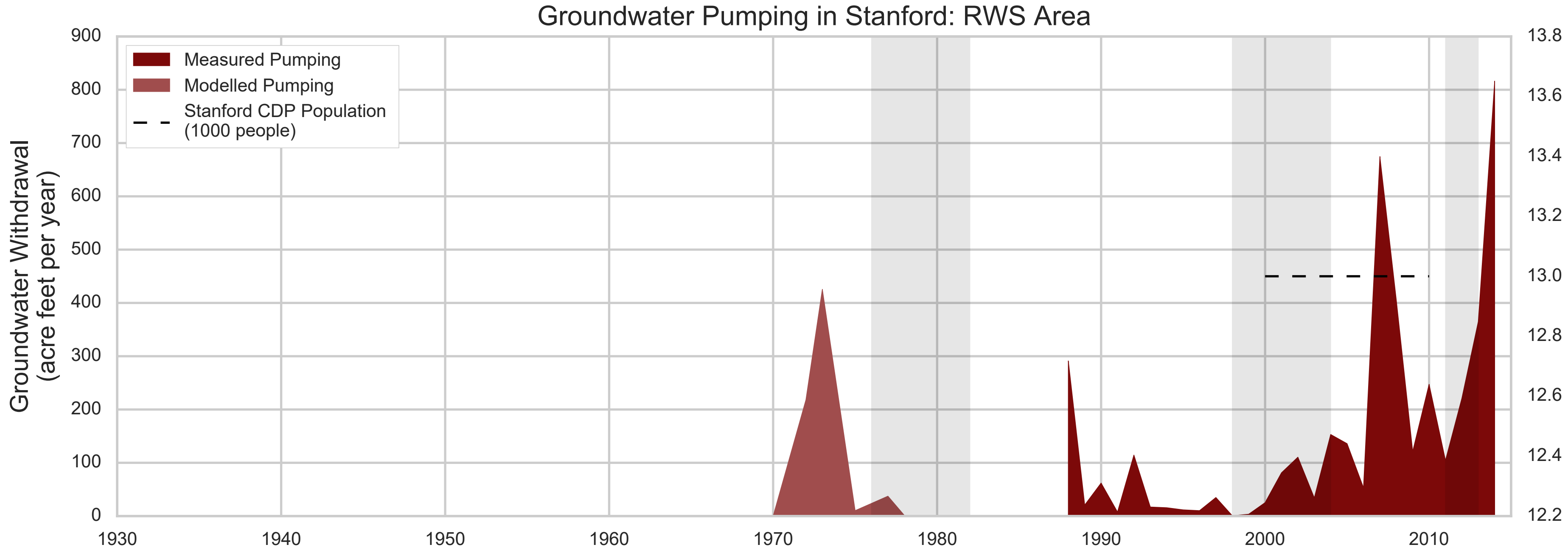

District Activity: Treated Water Delivery

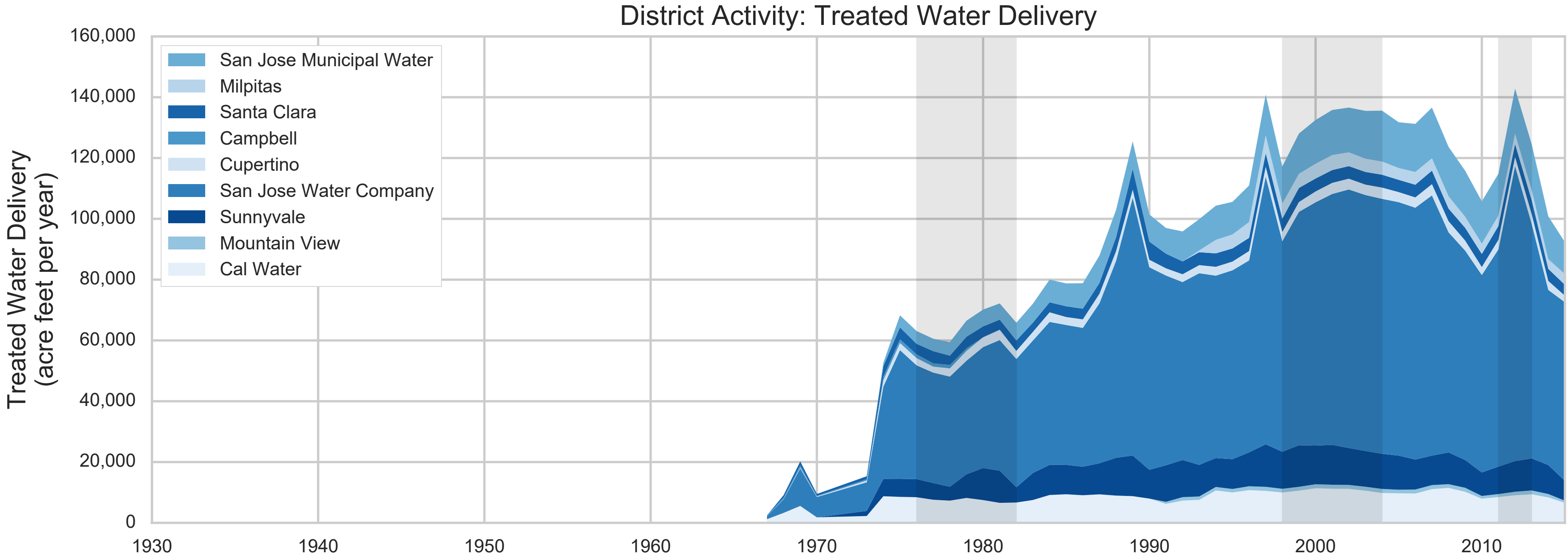

Observed Groundwater Elevation: 06S03W10D001

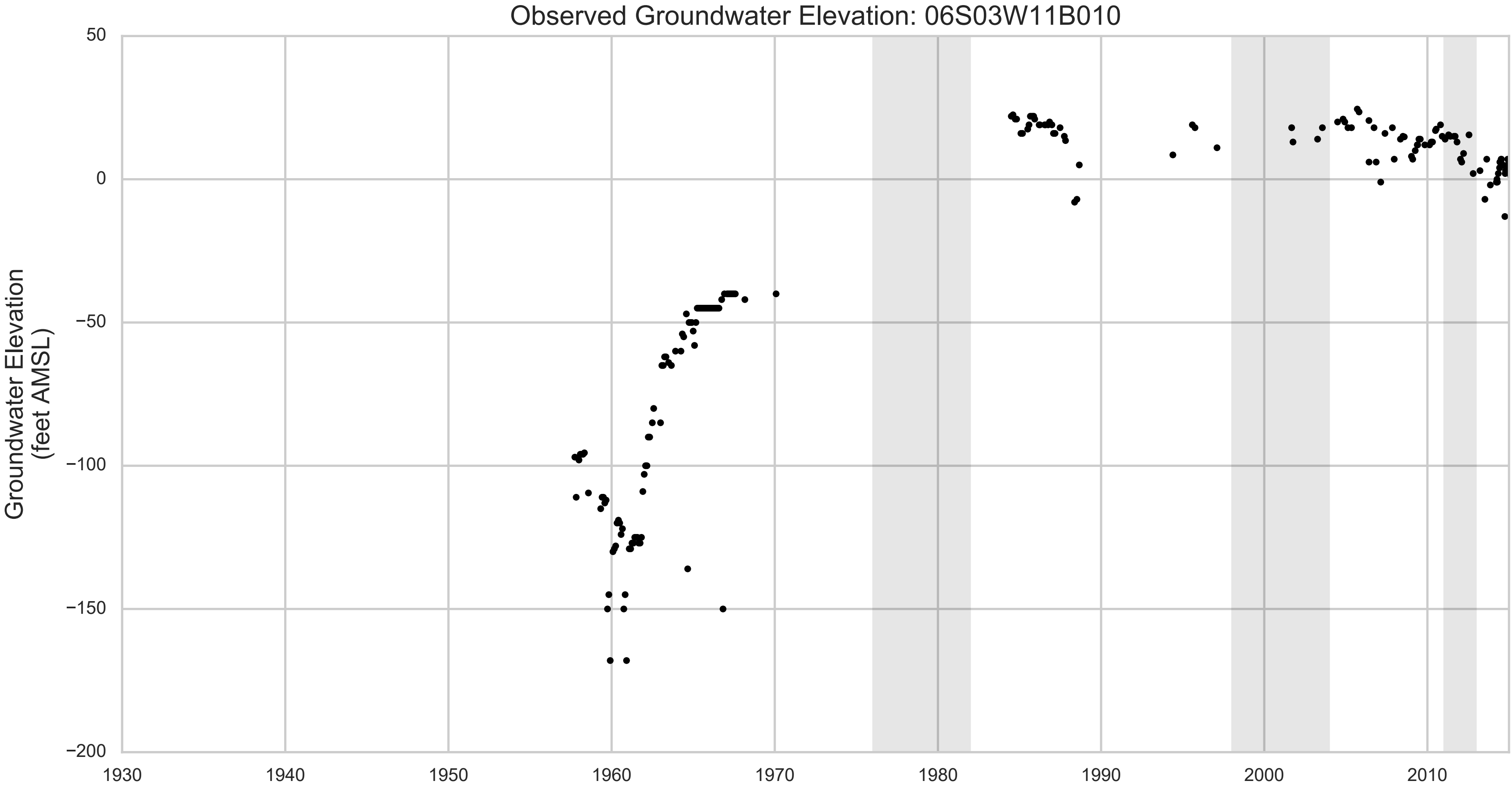
Monitored Pumping Wells well: 06S03W11B010
Minimum distance from activity: 15212 feet



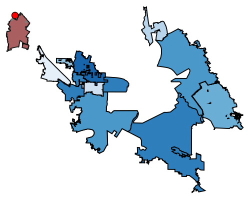




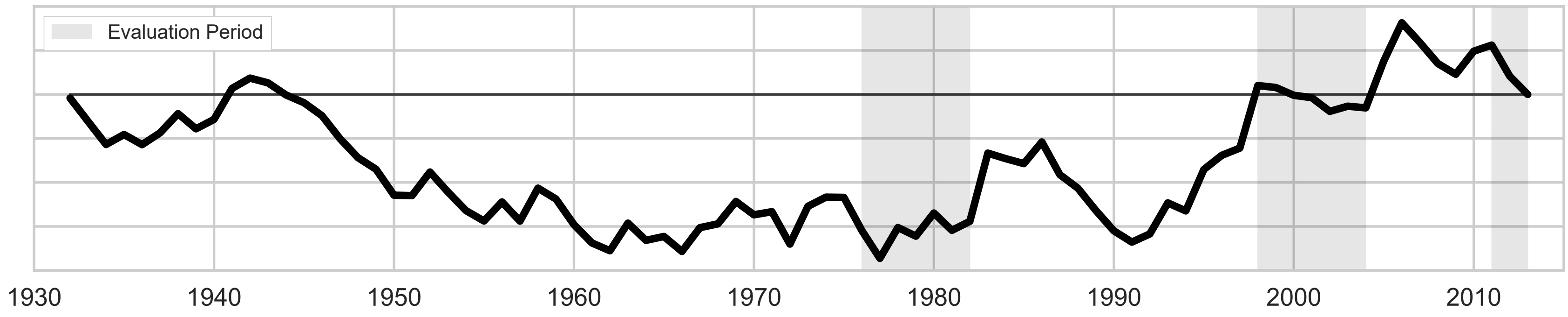




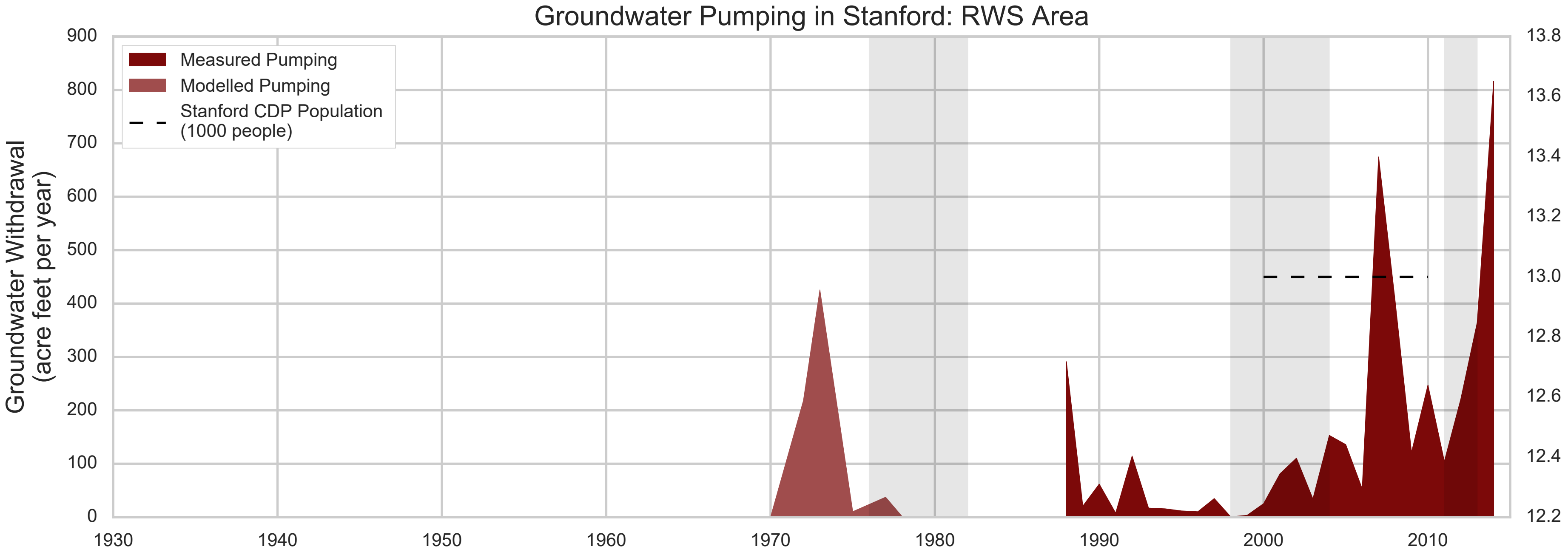
Monitored Pumping Wells well: 06S03W03L010
Minimum distance from activity: 21807 feet



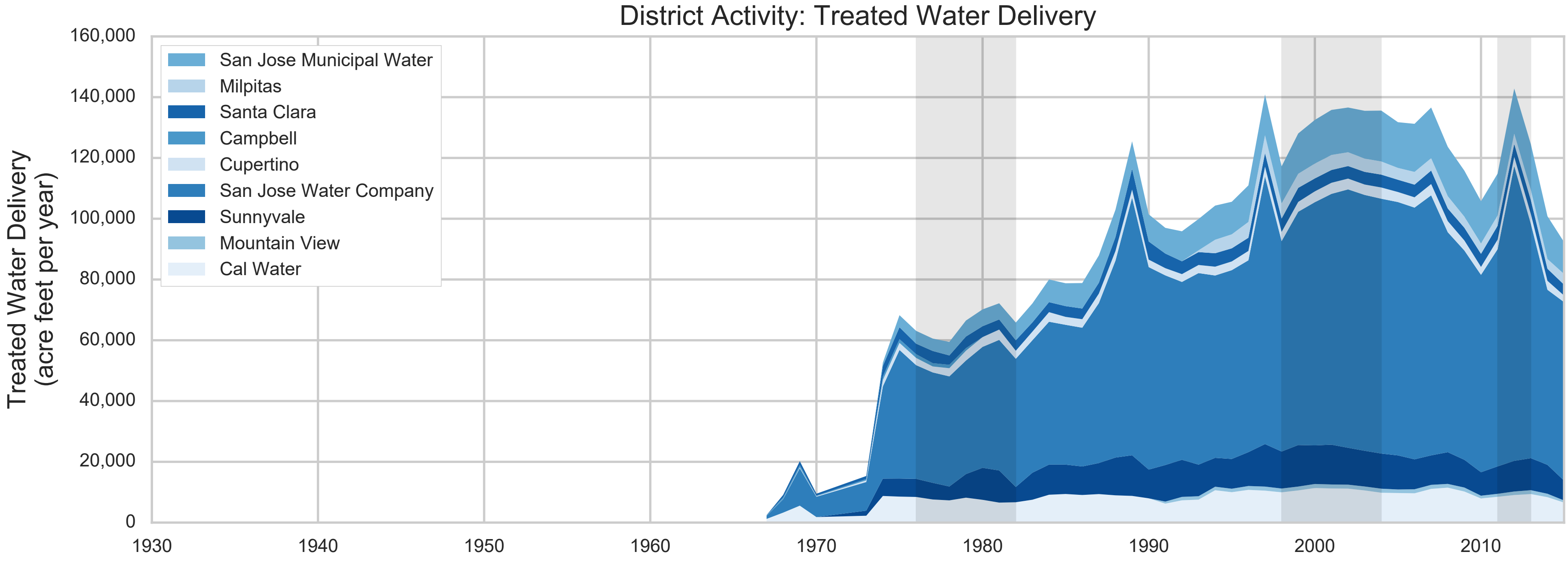
Cumulative Departure from Mean Annual Precipitation



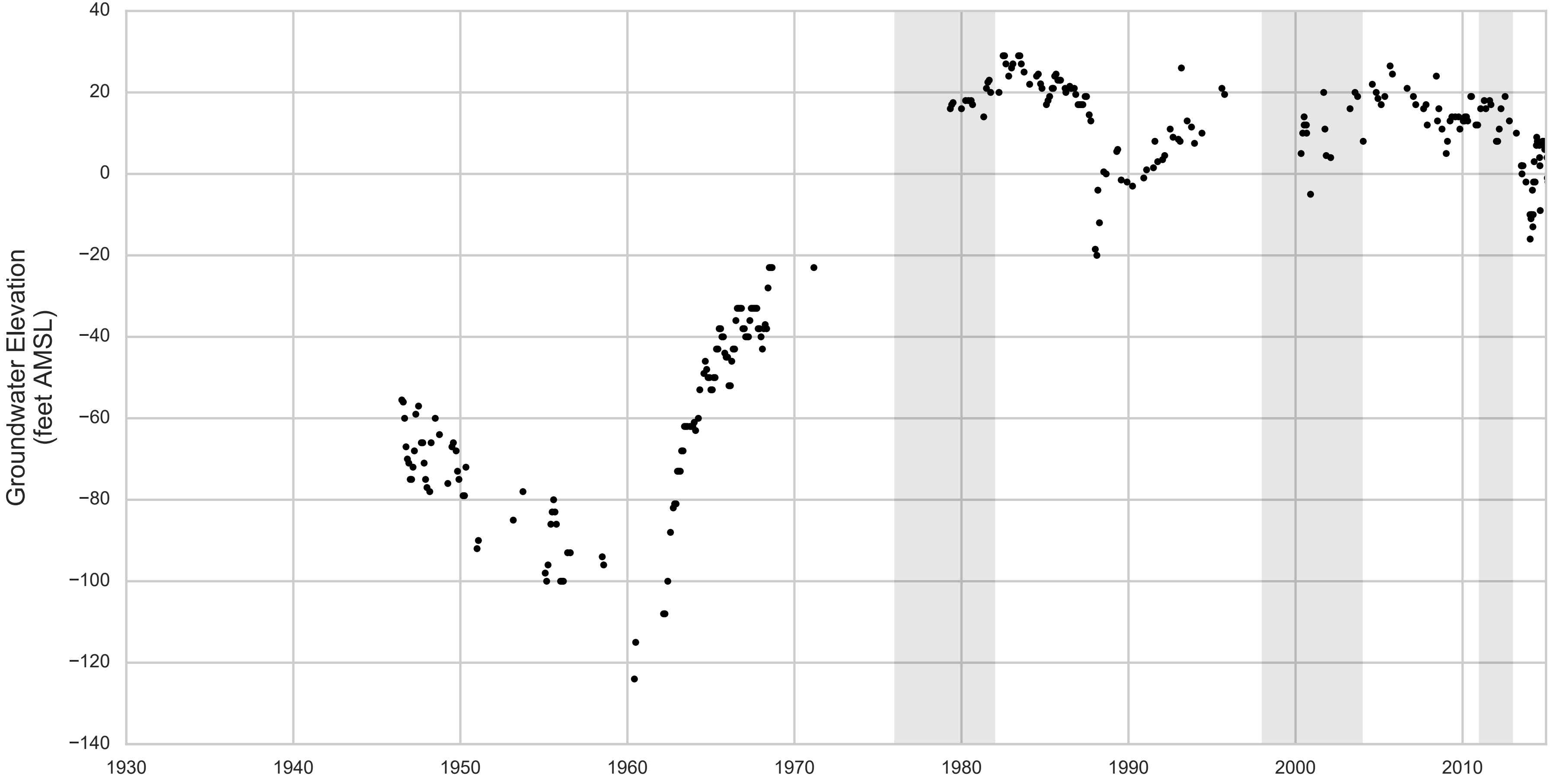
Groundwater Pumping in Stanford: RWS Area



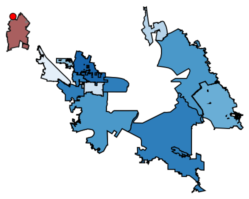
District Activity: Treated Water Delivery



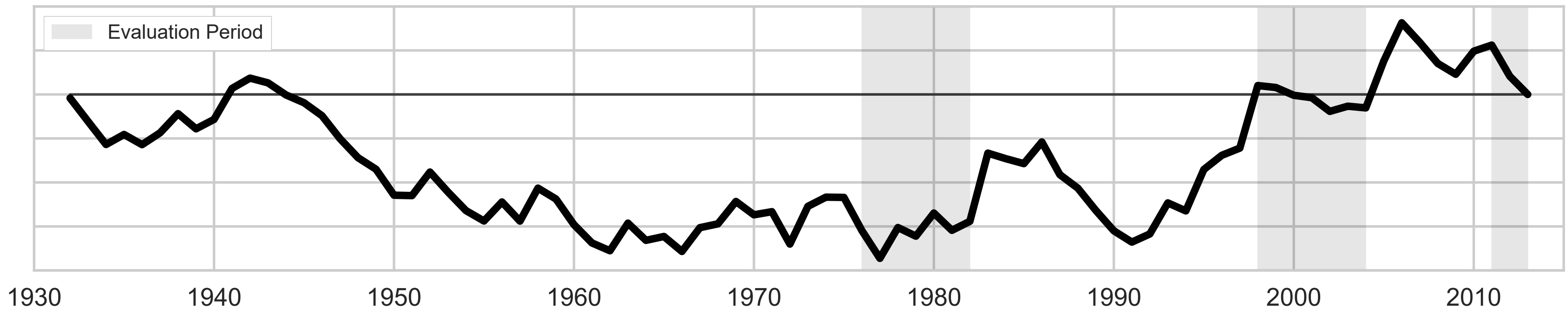
Observed Groundwater Elevation: 06S03W03L010



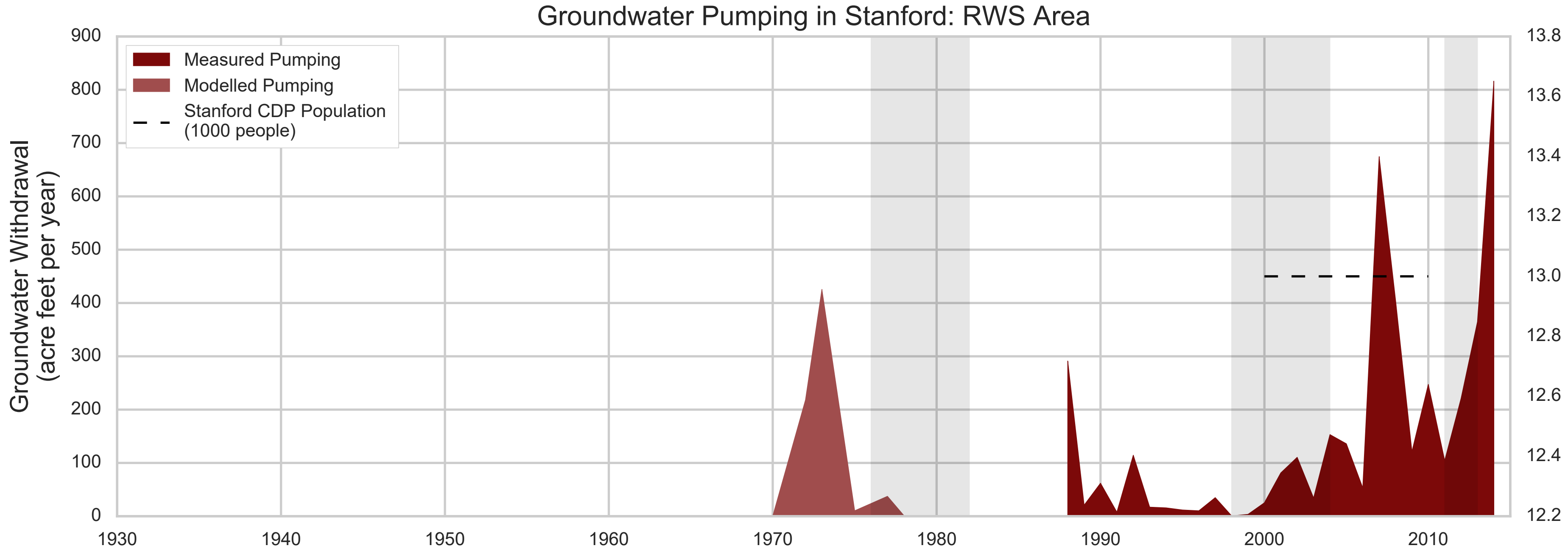
Monitored Pumping Wells well: 06S03W03M010
Minimum distance from activity: 22095 feet



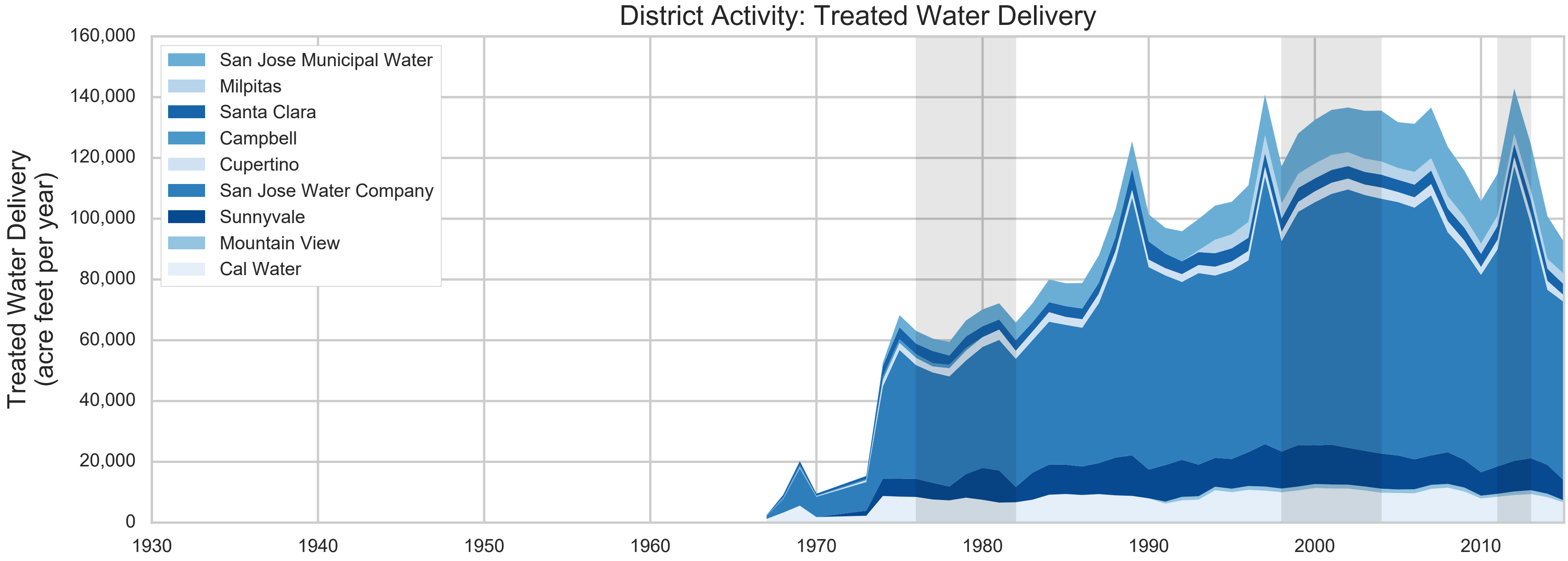
Cumulative Departure from Mean Annual Precipitation



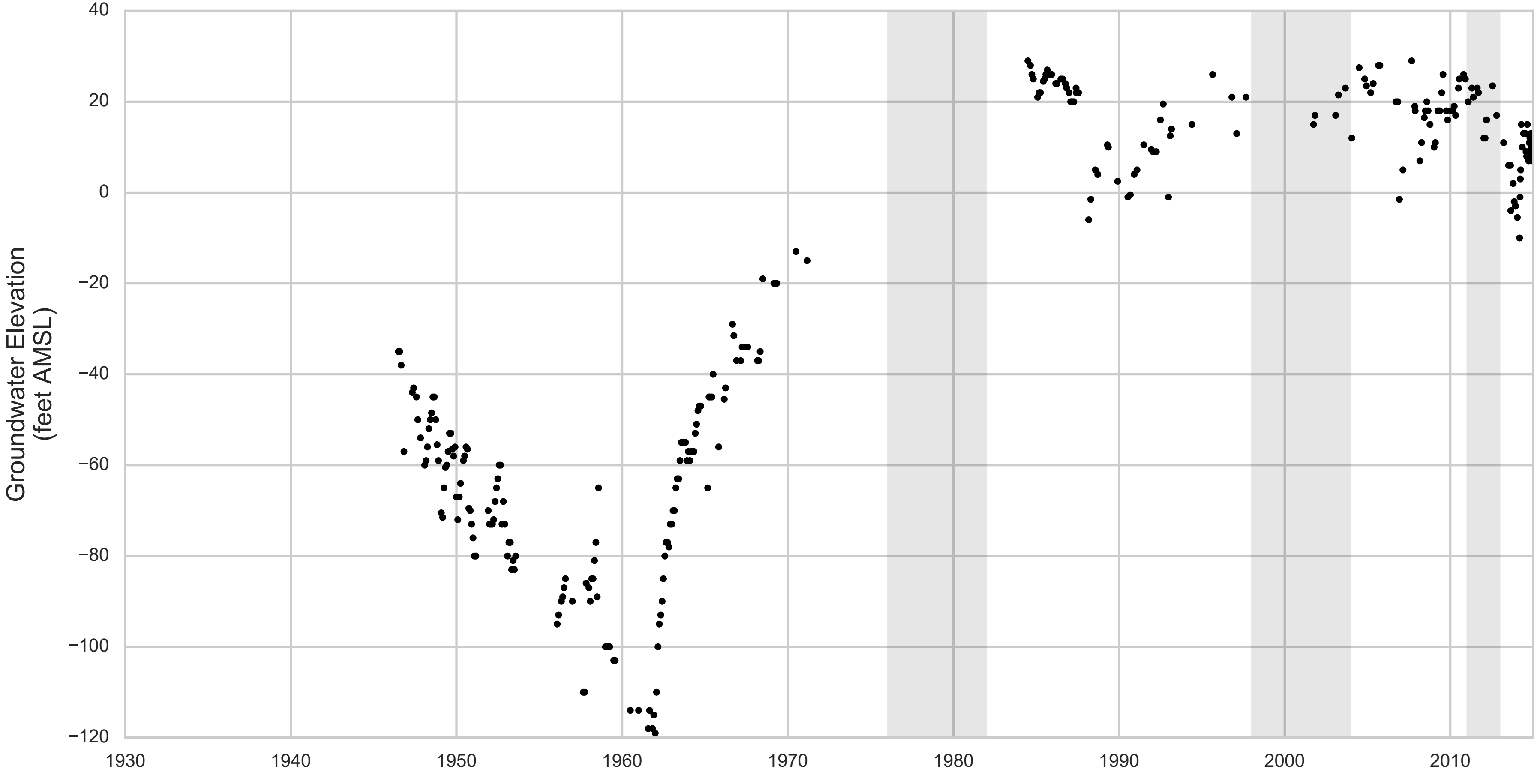
Groundwater Pumping in Stanford: RWS Area



District Activity: Treated Water Delivery



Observed Groundwater Elevation: 06S03W03M010



Stanford University

SUSTAINABILITY AND ENERGY MANAGEMENT

Vanessa De La Piedra, P.E., Unit Manager *via email to vdelapiedra@valleywater.org* July 16, 2019
George Cook, Specialist *via email to gcook@valleywater.org*
Groundwater Monitoring and Analysis Unit
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

Subject: Zones of Benefit Study – Stanford comments on SCVWD's response to previous Stanford comments

Dear Ms. De La Piedra and Mr. Cook:

We have reviewed the responses to our 2018 May comments on the subject report, and our technical consultant, Pete Leffler at Luhdorff & Scalmanini Consulting Engineers, has prepared the accompanying Technical Memorandum with our comments on the responses. We continue to have a much different perspective on the benefits to the far north county area from the District's recharge activities, and still see no evidence of any benefits to this area in the information provided. Moreover, we continue to question whether the Zone of Benefit Study supports the basis for the District's groundwater fee.

We would welcome an opportunity to discuss our comments with you and your consultant, and I will work with George to schedule that meeting. We look forward to continuing our discussions and reaching appropriate conclusions on this important issue.

Sincerely,

Tom W. Zigterman

Tom W. Zigterman, P.E., D.DRE
Director, Water Resources & Civil Infrastructure

c: Rob Donlan, Ellison, Schneider, Harris and Donlan
Tom Elson and Peter Leffler, Luhdorff & Scalmanini Consulting Engineers
Karla Daily, Palo Alto

Luhdorff & Scalmanini
Consulting Engineers

Technical Memorandum

DATE: June 28, 2019 PROJECT: 14-2-067

TO: Tom Zigterman
Stanford University

FROM: Peter Leffler

SUBJECT: **LSCE RESPONSES TO LETTER FROM SCVWD AND MONTGOMERY & ASSOCIATES, DATED NOVEMBER 20, 2018 (SCVWD) AND OCTOBER 26, 2018 (MONTGOMERY & ASSOCIATES) AND LSCE COMMENTS ON REVISED DRAFT REPORT DATED APRIL 2019**

INTRODUCTION

Santa Clara Valley Water District (SCVWD) provided a draft report entitled, "Preliminary Zones of Benefit Study, Santa Clara County, California," prepared by HydroMetrics and dated October 2017. Stanford University and Luhdorff & Scalmanini Consulting Engineers (LSCE) reviewed this study and provided comments in a letter dated May 11, 2018 from Stanford University (with attachment from LSCE dated May 7, 2018). SCVWD responded to Stanford/LSCE draft report study comments in a letter dated November 20, 2018 (with Montgomery & Associates (Montgomery) attachment dated October 26, 2018). SCVWD and Montgomery also prepared a revised draft report entitled, "Preliminary Groundwater Benefit Zones Study, Santa Clara County, California," dated April 2019. This Technical Memorandum (TM) provides LSCE responses to the November 20, 2018 letter from SCVWD (which includes the October 26, 2018 letter from Montgomery) and LSCE's comments on the revised draft report dated April 2019.

LSCE RESPONSES TO SCVWD LETTER DATED NOVEMBER 20, 2018 (WITH ATTACHMENT FROM MONTGOMERY DATED OCTOBER 26, 2018)

1. LSCE's Comment Number 1 stated in part,"…utilizing data only from a 2011 to 2013 time period, was clearly of insufficient duration to prove a benefit to the Stanford area." While not specifically stating it was in response to this comment, SCVWD/Montgomery stated that they are now also using data for the 1978 to 1982 and 1998 to 2004 time periods in their groundwater level data analysis. SCVWD/Montgomery state that Stanford Well 1 data from 1978 to 1982 shows a stable trend, and Stanford Well 1 and Well 2 data from 1998 to 2004 time period shows an increasing trend.

   LSCE Response: *The water level data from 1978 to 1982 cannot be used in this analysis because the regional trend of increasing groundwater levels from 1963 to 1984 derives from greatly* *decreased pumping by Palo Alto/Stanford between 1962 (in excess of 8,000 AFY) and 1974 (less than 1,000 AFY). Thus, the stable to increasing trend from 1978 to 1982 is clearly due to an extended recovery period from reduced local pumping, as is clearly obvious in all Palo Alto and Stanford wells with data from this time period. The Stanford Well 1 water level dataset is missing data from 1997 to 2000, making it essentially impossible to draw conclusions regarding trends from 1998 to 2004. The Stanford Well 2 dataset is similarly compromised by not having data from 1999 to 2001.*

2. LSCE's Comment Number 2 stated in part that there was a net stable to decreasing trend in water levels during the 2011 to 2013 evaluation period, and that this observation/conclusion is in contrast to the ZOB study claim of stable groundwater levels in Stanford wells during this time. The SCVWD/Montgomery response did not address this comment or make any further observations regarding the Stanford groundwater level data trends over the 2011 to 2013 time period.

   LSCE Response: *SCVWD/Montgomery apparently do not dispute LSCE's observation of the 2011 to 2013 time period being stable to decreasing in water level trends as opposed to their own statements to the contrary in the ZOB study. Instead, the SCVWD/Montgomery Response turns to two other time periods (1978 to 1982 and 1998 to 2004) in an attempt to support their claims regarding use of groundwater level data trends to support inclusion of the Stanford area in the ZOB. Our review of these two new time periods being added to the analysis is included in our response item 1, which indicate these data periods cannot be used in the analysis. Thus, there remains only the potentially valid time period of 2011 to 2013 as stated in the original ZOB study report, and one can only conclude these data do not support inclusion of the Stanford area in the ZOB.*

3. LSCE's review of groundwater level data for three different time periods as summarized above in items 1 and 2 further supports another statement in LSCE's original Comment 1 on the ZOB study, "It is important to note that the Zone of Benefits (ZOB) study provides for inclusion of the Stanford area in the ZOB based primarily on groundwater model simulation results." In contrast, SCVWD/Montgomery Response letter states, "Groundwater model simulation results are not the primary basis for inclusion of the Stanford area in the ZOB. The primary bases for inclusion of the Stanford area in the ZOB are the groundwater level trend evaluation and information about hydrogeologic connections."

   ***LSCE Response**: As stated above, it is clear that the groundwater level trend evaluation does not support inclusion of the Stanford area in the ZOB. Elsewhere in the SCVWD/Montgomery Response they acknowledge that, "…there are limitations in the data from, and modeling of, the Stanford area used in the study." The SCVWD/Montgomery Response makes no attempt to address or rebut the numerous comments made by LSCE regarding the model and its inadequacies to be used in the ZOB study for the Stanford area. Specifically, no responses are provided to LSCE comments 3 through 13 regarding the groundwater model used in the ZOB study.*

4. The SCVWD/Montgomery Response includes a section entitled, “Hydrogeological Connection with District Activities” that is based on their assumption that, “…benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity.” Essentially, this assumption states that whether or not an area is 0.1 miles, 1 mile, 10 miles, or 50 miles away from a District activity, it can be claimed to be within the ZOB if there is continuously mapped alluvium within that area.

   LSCE Response: *The fact that the ZOB study adopted this hydrogeological connection assumption does not make it correct or valid. A hydrogeologic connection as defined by SCVWD/Montgomery does nothing to prove a benefit is derived by a given area from District activities, it merely indicates a benefit is possible. Thus, it is not a valid assumption to state all that is required is a hydrogeologic connection, rather a hydrogeologic connection is one of multiple requirements to demonstrate a benefit from District activities. The other requirements to demonstrate a benefit are discussed above and in LSCE’s original comment letter, and these other requirements are not met.*

5. The SCVWD/Montgomery Response includes a section entitled, “Concept of Proportional Benefit” that states it is not possible to developed tiered zones relative to actual benefits derived from District activities.

   LSCE Response: *Historical data demonstrate that water levels in the Stanford area are closely tied to local groundwater pumping and development of a surface water supply from SFPUC. Any potential benefits from SCVWD activities are essentially irrelevant to local groundwater levels compared to the impacts of local pumping and use of the SFPUC surface water supply. In fact, development and use of the SFPUC surface water supply by Palo Alto and Stanford (and others in the area) has greatly benefited the groundwater basin managed by SCVWD (by effectively eliminating or greatly reducing pumping from many entities) and providing a source of additional groundwater recharge from outside the basin (e.g., excess irrigation recharge). One could reasonably argue that non-SFPUC water users in the groundwater basin receive an equal or greater benefit from SFPUC water users (including Stanford and Palo Alto) compared any potential benefits received by Palo Alto/Stanford from SCVWD activities. SCVWD would have to expend considerably more money and develop new facilities closer to the Palo Alto/Stanford area were it not for development and use of SFPUC surface water by these North County entities.*

LSCE COMMENTS ON REVISED DRAFT PRELIMINARY GROUNDWATER BENEFIT ZONES STUDY, MONTGOMERY & ASSOCIATES, DATED APRIL 2019

1. Executive Summary, page 15: The revised report text refers to evaluation of water budgets for the subbasin showing the benefits of District groundwater replenishment activities, including managed recharge and in-lieu recharge, and that without these activities pumping would exceed recharge. Thus, the report claims that District activities improve groundwater levels, thereby providing benefits related to groundwater supply reliability and avoidance of land subsidence and seawater intrusion.

LSCE Comment: *The water balance discussion does not consider the significant benefits of SFPUC surface water, and associated in-lieu and other recharge, to Stanford, Palo Alto, and other North County cities. Also, no details are provided of the various components of natural recharge and District activities to allow for peer review and validation of the summarized water balance in the revised draft report.*

2. Section 2.2, pages 27-28: The revised report text describes the history of SCVWD activities and associated rise/fall of groundwater levels in the basin. This discussion includes a statement that SFPUC water was delivered to north Santa Clara County in the 1950's, but groundwater pumping continued to increase and groundwater levels continued to fall. This discussion implies that delivery of SFPUC water to the Stanford/Palo Alto area did not resolve groundwater level issues in this area.

   LSCE Comment: *Significant deliveries of SFPUC surface water to the Stanford/Palo Alto area did not start until the early 1960's (approximately 1962). There was an immediate and dramatic response (recovery) in groundwater levels when Stanford/Palo Alto (and others) switched from groundwater pumping to SFPUC surface water supplies in the early 1960's. This recovery lasted at least through the 1980's, clearly correlated to onset of surface water supply use (instead of groundwater pumping) from the SFPUC RWS system. It is clear that the groundwater system budget deficit in the north Santa Clara County area was solved by SFPUC system surface water.*

3. Section 2.3, page 29: The report text states that, "Benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity."

   LSCE Comment: *This statement/criteria effectively makes all other analyses conducted to show benefits from SCVWD activities for the study unnecessary (e.g., groundwater level evaluation, groundwater modeling). This statement/criteria says that in areas of interconnected alluvium (which could be argued to extend north at least to the northern end of San Mateo Plain west of the Bay and incorporate Niles Cone and possibly East Bay Plain east of the Bay), groundwater pumpers are receiving benefits from District activities that are significant enough to warrant a charge/fee from SCVWD for groundwater pumping. The cut-off of charging for this fee at the San Mateo -Santa Clara County line is a jurisdictional boundary and not a hydrogeologic boundary per this statement. Stanford is located approximately 10 miles north of any SCVWD recharge activity in an area shown to be dramatically influenced by SFPUC surface water use. If not for use of SFPUC surface water in the early 1960's by Stanford, Palo Alto, and others, SCVWD would have had to invest in several additional recharge facilities in this area to provide the recovery in groundwater levels brought about by the SFPUC surface water use in the North County area.*

4. Section 3.2, page 31: The revised report text states, "Natural recharge is insufficient to support groundwater pumping in the subbasin…"; and

Section 3.3, page 32: The revised report text states, "Current groundwater pumping exceeds natural recharge…"

***LSCE Comment**: Natural recharge in the North County area (e.g., San Francisquito Creek, rainfall recharge, bedrock inflow, etc.), Stanford Lake Lagunita recharge, and other sources of recharge are likely more than sufficient to support current/recent groundwater pumping by Stanford and Palo Alto.*

5. Section 4, page 35: The report text provides a high level water budget summary for the year 2013.

   ***LSCE Comment**: 2013 represents the second year of a severe drought and is not representative of average conditions for natural recharge.*

6. Section 4.1, page 35: The report text states, "On average, groundwater accounts for forty percent of the water used in Santa Clara County. Groundwater pumping (approximately 150,000 acre-feet in 2013) far exceeds natural recharge."

   ***LSCE Comment**: These statements do not apply to Stanford (or Palo Alto) and likely others in the North County area.*

7. Section 4.2, page 37: The report text states, "…additional evaluation is required to associate the subsidence benefits to specific sets of District activities and account for other sources of recharge such as rainfall or in-lieu supplies of surface water from San Francisco Public Utilities Commission (SFPUC) Regional Water System (RWS)." A similar statement is made with regard to salt water intrusion on page 39 of the revised draft report.

   ***LSCE Comment**: It is not clear where in the revised draft report this additional analysis was conducted, and results provided related to accounting for recharge/in-lieu supplies from SFPUC RWS.*

8. Section 5.1.2, page 45: The revised draft report text states, "Unconsolidated Alluvium is mapped from the northern to the southern boundary of Santa Clara County." Section 5.4 (page 53) of the revised draft report states, "The 2015 USGS report (Wentworth et al., 2015) identifies continuous sedimentary stratigraphy from San Jose to the Palo Alto area." Section 6 (page 59) of the revised draft text states, "Water budgets for potentially hydrogeologically connected areas demonstrate the benefits form the District's groundwater replenishment activities."

   ***LSCE Comment**: Unconsolidated Alluvium essentially extends all around (East Bay north to Richmond, South Bay, West Bay up to at least Foster City) and beneath San Francisco Bay. Thus, the concept of demonstrating that a given area benefits from SCVWD activities as solely demonstrated by hydrogeologic connection of continuous alluvium is effectively meaningless. If this were true, then the Zone of Benefits Study would have only needed to provide a geologic map of alluvium and no other work needs to be done to prove a benefit from SCVWD activities. All the other evaluations and discussions in the report related to groundwater levels and* *groundwater modeling are unnecessary, because regardless of the outcome of those analyses the report will conclude a benefit exists for all areas within the study area simply because they are underlain by alluvium. In fact, this reasoning/rationale means that benefits from SCVWD activities would extend to a given area no matter how far away it is from SCVWD recharge facilities, including well beyond the boundaries of Santa Clara Valley Water District. While a hydrogeological connection is part of the requirements to prove a benefit from SCVWD activities, other requirements must also be met to prove a benefit.*

9. Section 6.1 page 59: The revised draft report states, "Natural recharge is not sufficient to support groundwater pumping in the subbasin…Groundwater replenishment activities are needed to balance groundwater pumping with total recharge…If groundwater pumping were to exceed recharge, groundwater levels would decline, resulting in…increased risk of land subsidence and saltwater intrusion. The plots show that groundwater replenishment activities are needed in all years."

   ***LSCE Comment**: This water budget analysis completely ignores vast differences in local water budgets compared to the District-wide water budget and ignores the use of SFPUC surface water in the Stanford/Palo Alto and surrounding North County region. Given the minimal groundwater pumping, the water budget in the Stanford/Palo Alto area likely even has recharge in excess on groundwater pumping, thereby providing benefits to the rest of the basin. Groundwater level declines in the Stanford/Palo Alto area are prevented by use of SFPUC surface water in the area. If SFPUC surface water were not used, the SCVWD would have to install very expensive managed recharge facilities in the Stanford/Palo Alto area to prevent groundwater declines and reduce potential for land subsidence and sea water intrusion.*

10. Section 6.3, page 66: The revised draft report text states, "Recycled water deliveries by the Palo Alto…Water Recycling systems supported by the District that reduces groundwater pumping…" and Section 7.3, page 73 states recycled water deliveries, "…are a relatively small part of the overall budget and therefore the effect is not expected to be observed in the groundwater level evaluation."

    ***LSCE Comment**: What groundwater pumping in the Stanford/Palo Alto area is being reduced by this activity, where SFPUC surface water is the primary source of supply? Furthermore, the report essentially says these recycled water deliveries are insignificant and local basin benefits cannot be quantified.*

11. Section 8, page 77: The revised draft report text item 2.b states that the groundwater level evaluation conducted for the report looked at time periods where groundwater levels would be expected to decline without SCVWD activities and, if groundwater levels during these time period were instead stable or increasing, a benefit from SCVWD activities is demonstrated. However, it goes on to say that even if groundwater levels show a declining trend during these selected time periods, it, "…does not indicate lack of benefit from District activities as the District activity may still be benefitting by limiting the decline in groundwater levels." In

addition, under Section 8.1 on page 77, the revised draft report text states, “Decreasing groundwater level trends are likely to be observed in many evaluation periods even with benefits from District activities occurring due to the rainfall and area pumping conditions.”

***LSCE Comment**: Effectively, this report text states that no matter whether the trend in groundwater levels in these specially selected time periods is increasing, stable, or decreasing, a benefit from SCVWD activities is demonstrated. Why bother to do this analysis because the report derives the same conclusion (any given area benefits from SCVWD activities) regardless of the outcome of the analysis?*

12. Section 8.1.2.1, page 79: The report text states, “…the Study maps retailer areas receiving water from San Francisco Public Utilities Commission’s RWS supplies…” and shows a map of these areas in Figure 26 on page 80.

    ***LSCE Comment**: The map shows a very large area of SFPUC RWS water supplies for the region from Stanford/Palo Alto extending south and east to San Jose Water Company’s service area and east to the east bay hills. The report does not address the benefits derived from SFPUC RWS water to the area in its evaluation of groundwater level trends and other analyses.*

13. Section 8.1.3, page 89: The report text states, “The Study does not evaluate managed recharge of imported water separately from managed recharge of local runoff because all managed recharge systems in Santa Clara Subbasin are connected to imported water supplies.”

    ***LSCE Comment**: The Study does not quantify (and subtract) the amount of local runoff that would recharge the basin anyway without SCVWD facilities, but rather assumes all that natural recharge from stream infiltration is due to SCVWD facilities.*

14. Section 8.2.4, page 111: The report text describes various time periods for Palo Alto and Stanford where the Study claims groundwater level trends show benefits from SCVWD activities.

    ***LSCE Comment**: The time periods 1975-1982 and 1978-1982 are greatly impacted by the ongoing long-term groundwater level recovery trend from the region converting from primarily groundwater use to SFPUC RWS supply in the 1960’s and cannot be used for groundwater level evaluation in the Study. The 1998-2002 time period represents part of a longer-term recovery from increased groundwater pumping during the drought in the late 1980’s/early 1990’s and cannot be used for groundwater level evaluation in the Study. The 2011-2013 time period actually shows stable to decreasing groundwater level trends and does not support the Study conclusion of demonstrating benefits from SCVWD activities. Overall, none to the selected time periods for the Stanford and Palo Alto groundwater level evaluation support the Study conclusion of demonstrating benefits from SCVWD activities in this North County region.*

Valley Water

Clean Water • Healthy Environment • Flood Protection

August 21, 2019

Mr. Tom Zigterman, Director of Water Resources & Civil Infrastructure
Stanford University
327 Bonair Siding
Stanford, CA 94305-7272

Subject: Response to Stanford Comments on Preliminary Groundwater Benefit Zone Study Report

Dear Mr. Zigterman:

Thank you for your letter dated July 16, 2019 and related technical memo from Luhdorff & Scalmanini Consulting Engineers (LSCE) dated June 28, 2019 providing additional feedback on the Preliminary Groundwater Benefit Zone Study Report (Preliminary Report). The Santa Clara Valley Water District (Valley Water) regrets that we have not been able to discuss your concerns in person, and will contact you again to try to arrange an additional meeting. Detailed responses to the Stanford/LSCE comments are addressed in the attached letter from our consultant, Montgomery & Associates.

Valley Water would like to address several broader issues raised by Stanford and LSCE. One recurring comment relates to the use of the groundwater model in proposing groundwater benefit zones in the Stanford area, which is near a model boundary. While we may debate the merits of the groundwater modeling or underlying construction and assumptions, that is not necessary. As noted in the Montgomery & Associates response, groundwater level data and the hydrogeologic connection to the larger Santa Clara Subbasin provide adequate support for inclusion of the Stanford area in a groundwater benefit zone.

The connection between water levels in the Stanford area and conditions in the larger Santa Clara Subbasin is noted in a report prepared for Stanford University[1], which states: “These relatively deep static groundwater levels reflect excessive regional groundwater pumping within the Santa Clara Valley. However, by the mid- to late-1960s, imported surface water supplies somewhat relieved groundwater pumping stresses in the Santa Clara Valley, and water levels began to rise.” It should also be noted that imported surface water supplies include not only San Francisco Public Utility Commission (SFPUC) supplies, but also Valley Water imported water deliveries, which began in the mid-1960s.

Stanford and others have also questioned the accounting for the benefits of SFPUC. Valley Water acknowledges that SFPUC deliveries benefit the Santa Clara Subbasin by reducing pumping (also called in-lieu recharge). While the study is conservative in accounting for the effects of SFPUC deliveries, it focuses only on the benefits from Valley Water activities, which are primarily funded by groundwater production charges collected in groundwater benefit zones. These benefits have been demonstrated in the Stanford/Palo Alto area. Because Stanford and Palo Alto overlie the Santa Clara Subbasin, we feel it is also important to note the relative scale of Valley Water activities within this interconnected subbasin. Within the Santa Clara Subbasin, Valley Water treated water deliveries average about 122,000 acre-feet per year (AFY) while SFPUC deliveries average about 54,000 AFY (based on data from 2005-2014). Recycled water and water conservation programs also greatly reduce the need for pumping. In addition, Valley Water directly adds about 54,000 AF of surface water to the Santa Clara Plain (the northern Santa Clara Subbasin) each year through managed recharge based on data from 2005 to 2014. While the basin benefits from the delivery of SFPUC supplies, the recharge volumes provided by Valley Water managed and in-lieu recharge are far greater.

---

[1] Final Report, Groundwater Resource Evaluation, Stanford University, Prepared by Geomatrix Consultants for Stanford University Operations and Maintenance, February 1992.

The issue of relative benefits has also been raised by Stanford/LSCE. The relative benefit is likely to continuously change with distance from Valley Water activities, making it impossible to define zones based on a specific level of benefit from any particular activity. Rather, the proposed zones are drawn based on the set of activities that improve the water budget of the shared resource, with the premise that all groundwater users in the zone should pay an equal share for the activity.

Staff plans to present the amended recommendation to the Valley Water Board of Directors on August 27, 2019. More information is available at https://www.valleywater.org/how-we-operate/board-meetings-agendas-minutes. Thank you again for your interest in the study, and for taking the time to meet with us and provide feedback. If you have any questions, please contact me at (408) 630-2964 or gcook@valleywater.org.

Sincerely,

George S Cook Jr

George Cook, P.G.
Senior Water Resources Specialist
Groundwater Management Unit

cc: Cameron Tana, Montgomery & Associates
N. Hawk, G. Hall, V. De La Piedra

Attachments: 1) August 16, 2019 Response to July 16, 2019 Stanford/LSCE Comments

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

www.elmontgomery.com
1814 Franklin Street, Ste. 501
Oakland, CA 94612
510.903.0458

August 16, 2019

George Cook
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3614

SUBJECT: STANFORD UNIVERSITY RESPONSES AND COMMENTS RE: GROUNDWATER BENEFIT ZONE STUDY FOR SANTA CLARA VALLEY WATER DISTRICT

Dear Mr. Cook:

Stanford University (Stanford) provided a technical memorandum prepared by Luhdorff & Scalmanini Consulting Engineers (LSCE) dated June 28, 2019 in continuation of correspondence regarding the Groundwater Benefit Zone Study (study) Montgomery & Associates (M&A) has prepared for Santa Clara Valley Water District (Valley Water or District). The technical memorandum prepared by LSCE responds to a M&A letter dated October 26, 2018, which was in turn a response to a LSCE technical memorandum dated May 7, 2018 and followed a meeting between Stanford, LSCE, Valley Water, and M&A on July 9, 2018. The most recent LSCE technical memorandum also provides comments on an updated draft of the Preliminary Groundwater Benefit Zone Study dated April 2019 provided to Santa Clara County water retailers for review.

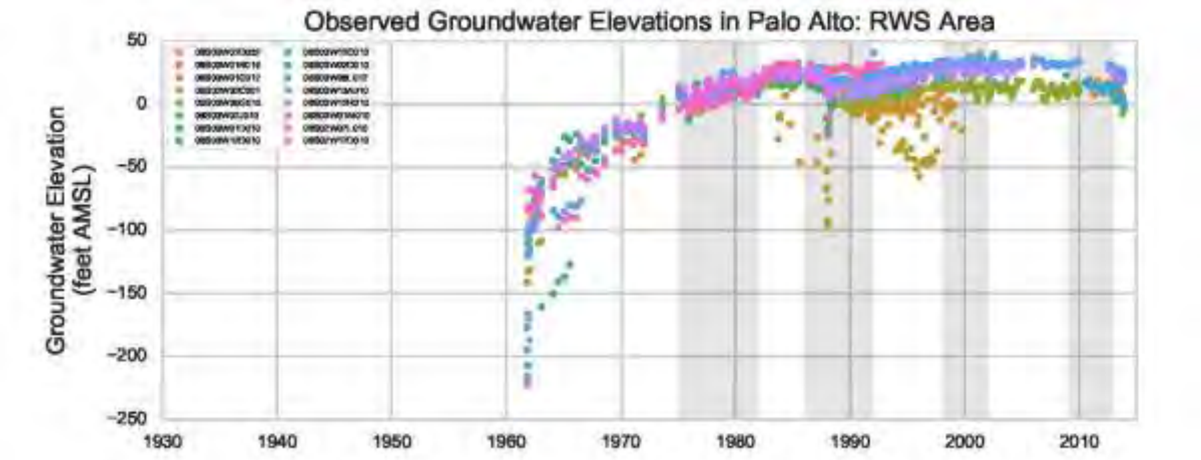
It should be noted that our October 26, 2018 letter was not meant to be a point by point response to the May 7, 2018 LSCE technical memorandum. This technical memorandum does respond to the June 28, 2019 LSCE technical memorandum point by point. LSCE's responses to M&A's October 26, 2018 letter and comments on the April 2019 draft report were numbered separately. This letter identifies the LSCE responses as part A and the comments as part B for referencing purposes. Subscript letters are added to the numbering where we address points within a LSCE response or comment separately.

LSCE RESPONSES TO M&A LETTER DATED OCTOBER 26, 2018 (PART A)

LSCE Response A-1a: *The water level data from 1978 to 1982 cannot be used in this analysis because decreased pumping by Palo Alto/Stanford between 1962 (in excess of 8,000 AFY) and 1974 (less than 1,000 AFY). Thus, the stable to increasing trend from 1978 to 1982 is clearly due to an extended recovery period from reduced local pumping, as is clearly obvious in all Palo Alto and Stanford wells with data from this time period.*

M&A Response: We disagree that the 1978 to 1982 is part of an extended recovery period from reduced local pumping. While we agree that groundwater level data clearly show recovery related to decreased pumping for the area between 1962 and 1970, LSCE asserts that recovery continues 12 years beyond the period when recovery in groundwater level occurs.. Groundwater levels observed in Palo Alto show a steep increase in groundwater levels in the 1960s that is best explained by decreased pumping by Palo Alto/Stanford followed by a flattening of the recovery curve during the 1970-1972 time period (Figure 1). This indicates that recovery from the Palo Alto/Stanford pumping reduction is ending prior to 1974 and the 1975-1982 period can be evaluated for benefits from Valley Water activities.

Figure 1. Groundwater Elevations at Monitored Pumping Wells in Palo Alto Retailer Area (excerpt from Study Report Figure 32)



It should also be noted that Valley Water deliveries of treated water increased from approximately 20,000 acre-feet in Water Year 1969 to approximately 60,000 acre-feet per year or higher by Water Year 1975. This coincides with an increase in groundwater levels in Palo Alto after the recovery curve had flattened out. The increase of Valley Water deliveries of treated water is a more likely explanation for this increase in groundwater levels than past or contemporaneous reductions in pumping in Palo Alto/Stanford. Annual precipitation increases are another possible explanation for this increase so this period is not included as an evaluation period for Valley Water benefits.

The groundwater level trend in the Palo Alto and Stanford areas during the 1975-1982 period is increasing and demonstrates the benefit from Valley Water activities in the Palo Alto and Stanford areas.

LSCE Response A-1b: *The Stanford Well 1 water level dataset is missing data from 1997 to 2000, making it essentially impossible to draw conclusions regarding trends from 1998 to 2004. The Stanford Well 2 dataset is similarly compromised by not having data from 1999 to 2001.*

M&A Response: Data from Stanford Well 1 (06S03W03L010) spanning 2001 to 2004 and Stanford Well 2 (06S03W03M010) spanning 2002 to 2004 are sufficient to evaluate the groundwater level trend during a period when precipitation is declining or stable, pumping in the Stanford area is stable or increasing, and treated water deliveries are relatively stable. The 2001 to 2004 subset would qualify as an evaluation period and can be used to evaluate benefits from Valley Water deliveries of treated water. The groundwater level trend during this period is increasing at Stanford Well 1 and stable at Stanford Well 2 and demonstrates the benefit from Valley Water deliveries of treated water in the Stanford area.

LSCE Response A-2: *SCVWD/Montgomery apparently do not dispute LSCE's observation of the 2011 to 2013 time period being stable to decreasing in water level trends as opposed to their own statements to the contrary in the ZOB study. Instead, the SCVWD/Montgomery Response turns to two other time periods (1978 to 1982 and 1998 to 2004) in an attempt to support their claims regarding use of groundwater level data trends to support inclusion of the Stanford area in the ZOB. Our review of these two new time periods being added to the analysis is included in our response item 1, which indicate these data periods cannot be used in the analysis. Thus, there remains only the potentially valid time period of 2011 to 2013 as stated in the original ZOB study report, and one can only conclude these data do not support inclusion of the Stanford area in the ZOB.*

M&A Response: We do not dispute LSCE's observation of the 2011 to 2013 time period being stable to decreasing in water level trends, which is consistent with the evaluation of trends during this time period in the Palo Alto area in the study report. We have revised the study report to state this finding. As described in our response to item A-1, the other two time periods are valid evaluation periods and support the demonstration of benefits from Valley Water activities in the Stanford area.

LSCE Response A-3*: As stated above, it is clear that the groundwater level trend evaluation does not support inclusion of the Stanford area in the ZOB. Elsewhere in the SCVWD/Montgomery Response they acknowledge that, "…there are limitations in the data from, and modeling of, the Stanford area used in the study." The SCVWD/Montgomery Response makes no attempt to address or rebut the numerous comments made by LSCE regarding the model and its inadequacies to be used in the ZOB study for the Stanford area. Specifically, no responses are provided to LSCE comments 3 through 13 regarding the groundwater model used in the ZOB study.*

M&A Response: As indicated by our response to item A-1, we stand by our previous statement from October 28, 2018 that "Groundwater model simulation results are not the primary basis for inclusion of the Stanford area in the ZOB. The primary bases for inclusion of the Stanford area in the ZOB are the groundwater level trend evaluation and information about hydrogeologic connections." Based on this, Valley Water previously decided not to address LSCE's May 7, 2018 comments 3 through 13 on the model point by point although it is still considered a useful supporting tool in evaluating the separate effects of different Valley Water activities.

It should be noted that Todd Groundwater recently modified and recalibrated the Valley Water model to evaluate groundwater conditions in northwest Santa Clara County as described in the *Groundwater Assessment and Indirect Potable Reuse Feasibility Evaluation and Implementation Strategy* (IPR report) prepared in November 2018 for Palo Alto and Valley Water. Model refinements included extending the model domain into Redwood City, simulating San Francisquito Creek as a stream interconnected with groundwater instead of a no-flow boundary, and adjusting aquifer parameters. IPR report analysis, including a water budget and model simulations, demonstrate the connection between the IPR study area (which includes Palo Alto/Stanford) and the larger Santa Clara Subbasin, as well as the benefits of Valley Water activities such as managed recharge and treated water deliveries (see response to item B-9 for more detail).

LSCE Response A-4: *The fact that the ZOB study adopted this hydrogeological connection assumption does not make it correct or valid. A hydrogeologic connection as defined by SCVWD/Montgomery does nothing to prove a benefit is derived by a given area from District activities, it merely indicates a benefit is possible. Thus, it is not a valid assumption to state all that is required is a hydrogeologic connection, rather a hydrogeologic connection is one of multiple requirements to demonstrate a benefit from District activities. The other requirements to demonstrate a benefit are discussed above and in LSCE's original comment letter, and these other requirements are not met.*

M&A Response: The study does consider hydrogeologic connection as one of multiple lines of evidence to demonstrate a benefit from Valley Water activities. As described in our response to item A-1, groundwater level data are sufficient to evaluate and demonstrate a benefit from Valley Water activities in the Stanford area.

In summarizing the M&A response from October 28, 2018, LSCE does not fully characterize the study's use of hydrogeologic connectivity to evaluate benefits when quoting the study's assumption that "…benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected)." The full quote from the M&A response, which is also included in what is now section 2.3 in the study report, is:

> If data and modeling are insufficient to assess whether an area benefits from District activities, the following assumptions are made:
>
> - Benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity.

In general, hydrogeologic connectivity is a well-documented and understood concept. Due to the size of local groundwater basins, applying the concept of hydrogeologic connectivity is necessary because it is not possible to collect data at enough points throughout the basin to evaluate benefits from District activities at every location in the basin. Using available data and hydrogeologic connectivity based on geologic mapping is a reasonable and sound approach for defining groundwater benefit zones.

LSCE Response A-5: *Historical data demonstrate that water levels in the Stanford area are closely tied to local groundwater pumping and development of a surface water supply from SFPUC. Any potential benefits from SCVWD activities are essentially irrelevant to local groundwater levels compared to the impacts of local pumping and use of the SFPUC surface water supply. In fact, development and use of the SFPUC surface water supply by Palo Alto and Stanford (and others in the area) has greatly benefited the groundwater basin managed by SCVWD (by effectively eliminating or greatly reducing pumping from many entities) and providing a source of additional groundwater recharge from outside the basin (e.g., excess irrigation recharge). One could reasonably argue that non-SFPUC water users in the groundwater basin receive an equal or greater benefit from SFPUC water users (including Stanford and Palo Alto) compared any potential benefits received by Palo Alto/Stanford from SCVWD activities. SCVWD would have to expend considerably more money and develop new facilities closer to the Palo Alto/Stanford area were it not for development and use of SFPUC surface water by these North County entities.*

M&A Response: Our response to item A-1 recognizes the benefit of SFPUC supplies to groundwater levels in the Stanford area, but also reaffirms the Study's conclusion that there are benefits of Valley Water activities to groundwater levels in the Stanford area. The Study focuses on benefits from Valley Water activities because groundwater charges reflect only the costs of Valley Water's activities that provide the benefit. Valley Water does not set charges based on the groundwater basin benefits resulting from SFPUC deliveries.

With its focus on benefits from SFPUC water supplies, Response A-5 recalls a different point that was also part of Stanford's November 5, 2015 comments which suggested that "The District should consider restoring the Groundwater Charge Credit for local investment in-kind groundwater management activities." Valley Water's response to this was as follows and applies here as well:

> The zone of benefit study is limited to creating zones based on benefits from District activities and does not encompass policies related to fees and charges, which will be considered after the zones are defined. Restoring a groundwater charge credit would be a separate policy consideration.

By referring to the comparative amount of benefits from Valley Water activities to groundwater users in the Palo Alto/Stanford area, Response A-5 also alludes to the concept of proportional benefit included in previous Stanford comments. Our October 28, 2018 letter provided a response on the concept of proportional benefit incorporated in LSCE's May 7, 2018 fourth major point that "there needs to be a sliding scale of pumping assessment." Our response to this point quoted Valley Water's April 18, 2016 response to Stanford's comments on the report methodology dated November 5, 2015 as follows:

> Our research and interpretation of groundwater benefit zones established by other California agencies does not present examples of a "relative weighting" concept as described by the commenter. The relative benefit is likely to continuously change with distance from District activities, so defining zones based on a specified level of benefit would be arbitrary. The methodology includes evaluation of different types of benefits in order to assess the extent of benefit to the water budget from specific District activities. However, the different types of benefit will not be used to assess or weigh relative benefit. The zones will be drawn based on District activity that is improving the water budget of the shared resource for the area and on the premise that all groundwater users in the associated area should pay an equal share for the activity.

LSCE COMMENTS ON REVISED DRAFT PRELIMINARY GROUNDWATER BENEFIT ZONES STUDY DATED APRIL 28 (PART B)

LSCE Comment B-1 re: Executive Summary reference to water budget evaluation: *The water balance discussion does not consider the significant benefits of SFPUC surface water, and associated in-lieu and other recharge, to Stanford, Palo Alto, and other North County cities. Also, no details are provided of the various components of natural recharge and District activities to allow for peer review and validation of the summarized water balance in the revised draft report.*

M&A Response: This part of the Executive Summary refers to Section 6 of the report titled "Benefits to Water Budget in Hydrogeologically Connected Areas from District Activities" which does not intend to cover in-lieu recharge benefits from non-Valley Water activities. The total pumping shown on Figures 15, 17, and 19 incorporates the benefits of in-lieu recharge benefits from SFPUC surface water and shows that Santa Clara Subbasin pumping exceeds natural recharge for the subbasin despite those in-lieu recharge benefits. We add an acknowledgement in Section 6.3 that total groundwater demand for the subbasin would be greater than what is shown on Figure 19 without SFPUC surface water deliveries as well as without Valley Water activities.

Section 7 provides details on the components of Valley Water activities. The Santa Clara Subbasin model documentation, which was provided to Stanford, provides a detailed description of both the natural and managed recharge components of the model (GMOD) that are used for these estimates.

LSCE Comment B-2 re: Section 2.2 discussion of history of Valley Water activities and effects on basin groundwater levels: *Significant deliveries of SFPUC surface water to the*

Stanford/Palo Alto area did not start until the early 1960's (approximately 1962). There was an immediate and dramatic response (recovery) in groundwater levels when Stanford/Palo Alto (and others) switched from groundwater pumping to SFPUC surface water supplies in the early 1960's. This recovery lasted at least through the 1980's, clearly correlated to onset of surface water supply use (instead of groundwater pumping) from the SFPUC RWS system. It is clear that the groundwater system budget deficit in the north Santa Clara County area was solved by SFPUC system surface water.

M&A Response: We have added recognition to this discussion of recovery that occurred in the 1960s after SFPUC surface water supplies replaced Stanford/Palo Alto groundwater pumping. As discussed in our response to item A-1, we disagree that recovery from SFPUC surface water supplies alone lasted through the 1980s. Our evaluation of groundwater level trends in the 1975-1982 and 1998-2004 periods demonstrate benefits from Valley Water activities in the Stanford and Palo Alto areas.

LSCE Comment B-3 re: Section 2.3 summary of methodology: *This statement/criteria effectively makes all other analyses conducted to show benefits from SCVWD activities for the study unnecessary (e.g., groundwater level evaluation, groundwater modeling). This statement/criteria says that in areas of interconnected alluvium (which could be argued to extend north at least to the northern end of San Mateo Plain west of the Bay and incorporate Niles Cone and possibly East Bay Plain east of the Bay), groundwater pumpers are receiving benefits from District activities that are significant enough to warrant a charge/fee from SCVWD for groundwater pumping. The cut-off of charging for this fee at the San Mateo -Santa Clara County line is a jurisdictional boundary and not a hydrogeologic boundary per this statement. Stanford is located approximately 10 miles north of any SCVWD recharge activity in an area shown to be dramatically influenced by SFPUC surface water use. If not for use of SFPUC surface water in the early 1960's by Stanford, Palo Alto, and others, SCVWD would have had to invest in several additional recharge facilities in this area to provide the recovery in groundwater levels brought about by the SFPUC surface water use in the North County area.*

M&A Response: As in item A-4, LSCE excerpts the report text "benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected)" but excludes the immediately preceding clause "if data and modeling are insufficient to assess whether an area benefits from District activities." As described in our response to item A-1, groundwater level data are sufficient to evaluate and demonstrate a benefit from Valley Water activities in the Stanford area.

There may be benefits from Valley Water activities to hydrogeologically connected areas beyond the County line, but the Groundwater Benefit Zone Study does not evaluate the extent of benefits in these areas because the District Act only permits Valley Water to establish groundwater benefit zones within its jurisdiction.

The Groundwater Benefit Zone Study only evaluates benefits from Valley Water activities. As described in response to item A-5, credit for benefits from non-Valley Water activities is a separate policy question.

LSCE Comment B-4 re: Section 3.2 and 3.3 statements that pumping exceeds natural recharge*: Natural recharge in the North County area (e.g., San Francisquito Creek, rainfall recharge, bedrock inflow, etc.), Stanford Lake Lagunita recharge, and other sources of recharge are likely more than sufficient to support current/recent groundwater pumping by Stanford and Palo Alto.*

M&A Response: Section 3 is an overview of Valley Water activities and describes pumping exceeding natural recharge in the subbasins. Benefits to specific areas such as Stanford and Palo Alto are evaluated using groundwater level data (Section 8) and modeling (Section 9).

LSCE Comment B-5 re: Section 4 water budget summary*: 2013 represents the second year of a severe drought and is not representative of average conditions for natural recharge.*

M&A Response: Section 4 is an overview of benefits from Valley Water activities and 2013 is provided as an example. Section 6 provides information on water budgets over time.

LSCE Comment B-6 re: groundwater pumping in Santa Clara County*: These statements do not apply to Stanford (or Palo Alto) and likely others in the North County area.*

M&A Response: Section 4 is an overview of benefits from Valley Water activities. Benefits to specific areas such as Stanford and Palo Alto are evaluated using groundwater level data (Section 8) and modeling (Section 9).

LSCE Comment B-7 re: analysis for subsidence (Section 4.2) and salt water intrusion (Section 4.3) benefits*: It is not clear where in the revised draft report this additional analysis was conducted, and results provided related to accounting for recharge/in-lieu supplies from SFPUC RWS.*

M&A Response: LSCE quotes Section 4.2 stating "…additional evaluation is required to associate the subsidence benefits to specific sets of District activities and account for other sources of recharge such as rainfall or in-lieu supplies of surface water from San Francisco Public Utilities Commission (SFPUC) Regional Water System (RWS)." The same paragraph later describes the additional evaluation as based on groundwater levels. We have revised this description for clarity to "As shown in Figure 5, raising groundwater elevations prevents subsidence so the Study uses historical groundwater level data and model results to evaluate benefits of preventing subsidence related to District activities." We have revised the similar description in Section 4.3 to "Raising groundwater elevations is the mechanism for reducing salt water intrusion so the Study uses historical groundwater level data and model results to evaluate benefits of reducing saltwater intrusion related to District activities." Therefore, the additional analyses are provided in Sections 8 and 9.

***LSCE Comment B-8 re: Section 5.1.2 discussion on mapping of Unconsolidated Alluvium**: Unconsolidated Alluvium essentially extends all around (East Bay north to Richmond, South Bay, West Bay up to at least Foster City) and beneath San Francisco Bay. Thus, the concept of demonstrating that a given area benefits from SCVWD activities as solely demonstrated by hydrogeologic connection of continuous alluvium is effectively meaningless. If this were true, then the Zone of Benefits Study would have only needed to provide a geologic map of alluvium and no other work needs to be done to prove a benefit from SCVWD activities. All the other evaluations and discussions in the report related to groundwater levels and groundwater modeling are unnecessary, because regardless of the outcome of those analyses the report will conclude a benefit exists for all areas within the study area simply because they are underlain by alluvium. In fact, this reasoning/rationale means that benefits from SCVWD activities would extend to a given area no matter how far away it is from SCVWD recharge facilities, including well beyond the boundaries of Santa Clara Valley Water District. While a hydrogeological connection is part of the requirements to prove a benefit from SCVWD activities, other requirements must also be met to prove a benefit.*

M&A Response: Please see responses to items A-4 and B-3.

***LSCE Comment B-9 re: Section 6.1 need for groundwater replenishment**: This water budget analysis completely ignores vast differences in local water budgets compared to the District-wide water budget and ignores the use of SFPUC surface water in the Stanford/Palo Alto and surrounding North County region. Given the minimal groundwater pumping, the water budget in the Stanford/Palo Alto area likely even has recharge in excess on groundwater pumping, thereby providing benefits to the rest of the basin. Groundwater level declines in the Stanford/Palo Alto area are prevented by use of SFPUC surface water in the area. If SFPUC surface water were not used, the SCVWD would have to install very expensive managed recharge facilities in the Stanford/Palo Alto area to prevent groundwater declines and reduce potential for land subsidence and sea water intrusion.*

M&A Response: The groundwater benefit zone study evaluates benefits to specific areas such as Stanford and Palo Alto from Valley Water activities based on groundwater level trend analysis and groundwater modeling. The groundwater level trend analysis is designed to only evaluate time periods when stable or increasing groundwater level trends can be attributed to Valley Water activities. This methodology addresses benefits from in-lieu recharge by SFPUC surface water deliveries to the Stanford/Palo Alto area by limiting evaluation periods to when pumping for the areas are stable or increasing. Response to item A-1a describes our conclusion that the 1975-1982 period is not part of a long-term recovery from introduction of SFPUC surface water and can be used as an evaluation period as part of this methodology. Groundwater modeling removes effects of non-Valley Water activities by only showing the effects of reducing Valley Water activities.

As described in the response to item A-5, the Study focuses on benefits from Valley Water activities because groundwater charges reflect only the costs of Valley Water's activities that provide the benefit.

The study does not cite the *Groundwater Assessment and Indirect Potable Reuse Feasibility Evaluation and Implementation Strategy* (IPR report) prepared in November 2018 for Palo Alto and Valley Water, but this report does provide information on the local water budget for the Stanford/Palo Alto area. The study area used in the IPR report to evaluate Palo Alto pumping yields and indirect potable use strategies covers the Stanford/Palo Alto area and also includes the Valley Water activities for managed aquifer recharge at Stevens Creek and delivery of treated water to City of Mountain View and the Los Altos District of California Water Service (Cal Water).

Table 3-5 of the IPR report summarizes the contemporary average annual water balance for the study area and includes 1,420 acre-feet per year (AFY) of percolation releases by Valley Water along Stevens Creek. Pumping in this water balance would be higher by more than 1,180 AFY if not for Valley Water in-lieu recharge based on the 2005-2014 average for treated water deliveries to City of Mountain View. The 2005-2014 average for Valley Water treated water deliveries to the California Water Service Company (Cal Water) totaled approximately 9,500 AFY. Cal Water delivers that water to the City of Los Altos within the study area and a portion of the City of Cupertino outside of the study area. Without these Valley Water contributions to the water balance for the IPR report study area, the pumping yield available for Palo Alto would be significantly lower than the 2,900 AFY estimated by the IPR report.

The IPR report also uses the modified and recalibrated groundwater model as described in response to item A-3. The model estimates the net average annual groundwater inflow from other areas of the Santa Clara Plain into the study area at approximately 2,300 AFY. This inflow is used to evaluate Palo Alto pumping yields and indirect potable use strategies. This provides additional, independent analysis indicating that Valley Water activities south of the study area have water budget benefits to the IPR study area including Stanford.

LSCE Comment B-10 on Section 6.3 re: recycled water deliveries by Palo Alto*: What groundwater pumping in the Stanford/Palo Alto area is being reduced by this activity, where SFPUC surface water is the primary source of supply? Furthermore, the report essentially says these recycled water deliveries are insignificant and local basin benefits cannot be quantified.*

M&A Response: The recycled water deliveries allow for reduction of surface water deliveries without increasing groundwater pumping and therefore contributes to in-lieu recharge for the hydrogeologically connected area of the Basin. We have added this additional mechanism to Section 6.3 text.

The report does not state recycled water deliveries are insignificant. The report states in Section 7.3 that "these deliveries are a relatively small part of the overall budget and therefore the effect is not expected to be observed in the groundwater level evaluation." Groundwater modeling shows the benefits of in-lieu recharge from recycled water deliveries to hydrogeologically connected areas (section 9.2.4 for Santa Clara Plain). The modeling supports assigning benefits from this Valley Water activity to the zones recommended for the hydrogeologically connected areas.

LSCE Comment B-11 on Section 8 description of 2nd step of groundwater level data evaluation*: Effectively, this report text states that no matter whether the trend in groundwater levels in these specially selected time periods is increasing, stable, or decreasing, a benefit from SCVWD activities is demonstrated. Why bother to do this analysis because the report derives the same conclusion (any given area benefits from SCVWD activities) regardless of the outcome of the analysis?*

M&A Response: LSCE's excerpts from the report mischaracterize the point of the statements quoted. The full description of the 2nd step of the groundwater level data evaluation is as follows with emphasis added.

> 2. During these evaluation periods, evaluate whether observed groundwater level data in the area show a stable or increasing trend demonstrating a benefit from the District activity***. If the benefit from District activities is demonstrated in one evaluation period,*** it is considered to occur as long as the District activity is taking place:
>
> a. Section 6 shows District activities have been providing benefit to the water budget for all periods, whether or not they meet evaluation criteria.
>
> b. Evaluation periods are periods of expected declining groundwater. If during these periods groundwater levels are stable or increasing, the benefit of the District activity is demonstrated. The benefit from the District activity is not demonstrated if declining groundwater levels are observed, but this also does not indicate lack of benefit from District activities as the District activity may still be benefitting by limiting the decline in groundwater levels.

To answer LSCE's question, we perform the groundwater level evaluation to identify whether there is at least one evaluation period that demonstrates the benefit from Valley Water activities. There are many factors that influence groundwater levels. The evaluation periods were specifically chosen to ensure factors other than Valley Water activities would not be the cause of the stable or increasing groundwater level trend used to demonstrate the benefit. It is therefore by design that evaluation periods are unlikely to demonstrate benefits. The statements that LSCE quotes makes this point that other evaluation periods where groundwater level trends are declining are likely due these other factors and do not contradict a period where benefit is demonstrated and the benefit demonstrated in one period continues as long as the Valley Water activity is occurring.

LSCE Comment B-12 re: Section 8.1.2.1 describing maps of retailer areas receiving SFPUC RWS water*: The map shows a very large area of SFPUC RWS water supplies for the region from Stanford/Palo Alto extending south and east to San Jose Water Company's service area and east to the east bay hills. The report does not address the benefits derived from SFPUC RWS water to the area in its evaluation of groundwater level trends and other analyses.*

M&A Response: As described in the response to item A-5, the Study focuses on benefits from Valley Water activities because groundwater charges reflect only the costs of Valley Water's activities that provide the benefit. However, as described in response to item B-9, the groundwater level evaluation and modeling account for benefits from SFPUC RWS in evaluating whether benefits are demonstrated by Valley Water activities.

LSCE Comment B-13 re: Section 8.1.3 describing water sources for managed recharge*: The Study does not quantify (and subtract) the amount of local runoff that would recharge the basin anyway without SCVWD facilities, but rather assumes all that natural recharge from stream infiltration is due to SCVWD facilities.*

M&A Response: While there would be natural recharge through streams without Valley Water's managed recharge, it would be far less without our infrastructure, water supplies, and water management. Valley Water carefully manages and gauges releases to target the recharge area for basin replenishment. In this study, we are only accounting for those managed, gauged releases within the recharge area. Total quantities of managed recharge of local runoff are included in Valley Water activities because those total quantities are managed by Valley Water and therefore quantify the activity.

LSCE Comment B-14 re: Section 8.2.4 describing groundwater level trend evaluation for Stanford and Palo Alto*: The time periods 1975-1982 and 1978-1982 are greatly impacted by the ongoing long-term groundwater level recovery trend from the region converting from primarily groundwater use to SFPUC RWS supply in the 1960's and cannot be used for groundwater level evaluation in the Study. The 1998-2002 time period represents part of a longer-term recovery from increased groundwater pumping during the drought in the late 1980's/early 1990's and cannot be used for groundwater level evaluation in the Study. The 2011-2013 time period actually shows stable to decreasing groundwater level trends and does not support the Study conclusion of demonstrating benefits from SCVWD activities. Overall, none to the selected time periods for the Stanford and Palo Alto groundwater level evaluation support the Study conclusion of demonstrating benefits from SCVWD activities in this North County region.*

M&A Response: Our response to item A-1 affirms our use of 1975-1982 and 1978-1982 evaluation periods as recovery from conversion to SFPUC RWS supply in the 1960s had stabilized by the early 1970s. Our records for groundwater pumping in Palo Alto and Stanford for 1998-2002 and 1998-2004 shows that groundwater pumping in Palo Alto and Stanford is higher over these periods than most of the 1990s period, which is why they were selected as evaluation periods. Groundwater level trends during these periods demonstrate benefits from Valley Water activities in the Stanford and Palo Alto areas. As described in response to item A-2, we have revised description of our evaluation of the 2011-2013 time period to be consistent with the comment.

The communication with Stanford and LSCE has been beneficial in helping us clarify and correct language in the report and has also affirmed our conclusion that Stanford and Palo Alto areas should be included in groundwater benefit zone A.

Sincerely,

MONTGOMERY & ASSOCIATES

Cameron Tana

Cameron Tana, P.E.
Principal Hydrologist

Luhdorff & Scalmanini
Consulting Engineers

Technical Memorandum

DATE: September 13, 2019 PROJECT: 14-2-067

TO: Tom Zigterman
Stanford University

FROM: Peter Leffler

SUBJECT: **PRELIMINARY RESPONSES TO SCVWD LETTER DATED AUGUST 21, 2019 AND MONTGOMERY ASSOCIATES LETTER DATED AUGUST 16, 2019**

INTRODUCTION

This Technical Memorandum (TM) provides our preliminary responses to letters from the Santa Clara Valley Water District (SCVWD) dated August 21, 2019 and Montgomery Associates (MA) dated August 16, 2019. The SCVWD and MA letters provide responses to a Stanford letter dated July 16, 2019 and Luhdorff & Scalmanini Consulting Engineers (LSCE) TM dated June 28, 2019. LSCE had originally provided comments dated May 7, 2018 on the Draft Zone of Benefits (ZOB) Study for SCVWD (prepared by MA). This response is preliminary and not comprehensive due to limited time available for review and introduction of new modeling results by SCVWD/MA that were not previously referenced or made available for our review. Thus, the comments below attempt to address the primary issues from our initial review and may be supplemented with additional review comments at a later date.

PRELIMINARY REVIEW COMMENTS

1. The District states that groundwater modeling results are not needed to support District claims; and that groundwater level evaluation and hydrogeologic connection analysis results are sufficient by themselves to support District claims (District Letter, Page 1, 2nd Paragraph).

   LSCE Response:

   a. *Despite the statement above, Montgomery Associates (MA) responses refer to support from groundwater modeling results on numerous occasions; some examples include M&A responses to LSCE comments B-4, B-6, and B-7 (page 8 of M&A letter), M&A response to LSCE comment B-9 (page 9 of M&A letter), M&A response to LSCE comment B-10 (page 11 of M&A letter), and M&A response to LSCE comment B-12 (page 12 of M&A letter).*

   b. *As described elsewhere in this TM, groundwater level evaluation conducted for the Zone of Benefits study does not support District claims with respect to the Stanford/Palo Alto area.*

---

c. *The District/MA switch from use of the District groundwater model to claims based on a new Todd model for City of Palo Alto Indirect Potable Reuse (IPR) study.*

   1) *MA cite claim of 2,300 acre-feet per year (AFY) of groundwater inflow from the south (Santa Clara Plain) into the model domain from a future baseline (2015-2044) Todd model run (MA Letter, Page 10).*

      a) *The Todd Report review/assessment of historic and current water balances shows no groundwater inflow from the south. This is based in part and confirmed by observed groundwater level data and groundwater elevation contours showing a groundwater flow direction that is parallel to southern model boundary. Thus, the cited future scenario model results do not agree with historic/current observed data.*

      b) *Inflow across the southern model domain of the Todd model is strictly dependent on the specific assumptions made and incorporated in the general head boundary condition at this location. The details of the model baseline run and assumptions are not described in the City of Palo Alto IPR report. LSCE requested to obtain additional details on this topic, including model files, from SCVWD but has not yet been provided this information for review.*

      c) *A local model, such as prepared by Todd for the IPR study, is not an adequate tool/method for evaluating potential benefits from Valley Water activities in the Stanford area. The use of a groundwater model for the Zone of Benefits study should be a regional scale model of the Santa Clara Plain and surrounding areas (e.g., San Mateo Plain) that address previous LSCE comments on the regional-scale model originally cited in the Zone of Benefits study.*

2. District cites text in a Geomatrix (1992) report purported to demonstrate that connection between water levels in the Stanford area and conditions in the larger Santa Clara Subbasin (District Letter, Page 1, 3rd Paragraph).

   LSCE Response:

   a. *The Geomatrix report text cited by the District is very general and non-specific as to location of pumping, and there was no detailed analysis conducted by Geomatrix in support of the cited text.*

   b. *The Geomatrix report text also notes in reference to Stanford well water levels that, "The recovery of groundwater levels in both wells appears to have continued into the 1980s."*

   c. *One of the Geomatrix report conclusions is, "Groundwater pumping likely will be limited by SCVWD's restrictive fee schedule rather than by hydrogeologic constraints."*

   d. *A Geomatrix report conclusion states, "Groundwater levels must be allowed to recover…during the next wet period, so that the groundwater reservoir will be recharged for* *use during the next dry period." This statement supports LSCE contention that the initial portion of the 1998-2004 evaluation period was influenced by recovery of groundwater levels from pumping by Palo Alto/Stanford (and perhaps others) during the late 1980s/early 1990s drought period.*

3. The District states, "Stanford and others have also questioned the accounting for the benefits of SFPUC. Valley Water acknowledges that SFPUC deliveries benefit the Santa Clara Subbasin by reducing pumping (also called in-lieu recharge). (District Letter, Page 1, 4th Paragraph).

   LSCE Response:
   a. *It is important to note that SFPUC deliveries provide more than just in-lieu recharge. SFPUC deliveries also provide direct recharge to the subbasin from a water source outside the subbasin via recharge of excess irrigation water at residences, parks, and other irrigated lands, and also provide opportunities for use of recycled water derived from SFPUC deliveries within the subbasin.*

4. The District states, "While the study is conservative in accounting for the effects of SFPUC deliveries, it focuses only on the benefits from Valley Water activities…" (District Letter, Page 1, 4th Paragraph).

   LSCE Response:
   a. *It remains unclear how the Zone of Benefits study accounted for effects of SFPUC deliveries in any fashion (much less being "conservative" in this regard), other than by acknowledging that SFPUC deliveries have and do occur (resulting in reduced basin groundwater demand).*

5. The District argues that basinwide water budget components overwhelm SFPUC RWS water budget components, "While the basin benefits from the delivery of SFPUC supplies, the recharge volumes provided by Valley Water managed and in-lieu recharge are far greater." (District Letter, Pages 1 and 2, 4th Paragraph).

   LSCE Response:
   a. *The key issue here is the groundwater basin is very large and it is very important to consider local water budget components that have a much larger and overriding influence on individual well water levels compared to regional water budget components located much further away.*

6. The District states that it is impossible to implement a gradual change in pumping fees based on distance away from District activities and that all users should pay the same amount for the shared resource (District Letter, Page 2, 2nd Paragraph; MA Letter, Pages 5 and 6).

   LSCE Response:
   a. *Given that there is no threshold of significance for "benefits" from District activities, as it stands right now the District is arguing that an area that receives 0.1 foot of water level*

benefit should pay the same amount as an area that receives 100 feet of water level benefit from District activities.

b. *One alternative is to establish a reasonable significance threshold for District benefits (e.g., 5 feet), plus discounting of the fee for areas that contribute to the basin water balance by bringing in non-SCVWD surface water sources for in-lieu and direct uses and for other mechanisms of subbasin recharge (e.g., Lake Lagunita).*

7. MA states that the time period from 1975/1978 to 1982 is not part of the extended recovery period as stated by LSCE; therefore, increasing groundwater levels during this time period support District benefit claims (MA Letter, Pages 1 and 2).

   LSCE Response:

   a. *Despite the statement above (and while two Palo Alto wells have one or two data points that might be interpreted to suggest temporary stabilization of water levels between 1970 and 1972), water levels from two other Palo Alto wells plus the overall trend from Stanford wells do not show stabilization of water levels until the early 1980's and later.*
   b. *While City of Palo Alto groundwater pumping essentially went to 0 immediately after 1962 (until 1988), Stanford groundwater pumping continued at over 1,000 AFY (to as much as 2,100 AF in 1968) from 1960 to 1973. After 1973, Stanford groundwater pumping was less than 500 AFY except in 1988, 1990, 2001, and 2007-2008. Thus, it is not possible for stabilization in the Stanford/Palo Alto area to have occurred in 1970-72 as suggested by MA, because the Stanford area had to recover from abrupt reductions in local pumping after 1973 along with the continuation of ongoing recovery from reductions in local pumping after 1962.*
   c. *Groundwater elevations in Palo Alto Rinconada and Seale wells (the two wells with slight indication of stabilization in 1970-72) were -20 to -40 feet MSL in 1970-72, whereas groundwater elevations ultimately recovered in these wells to +20 to +30 feet MSL by the late 1980's. Again, it is clear these two wells were in recovery during the 1970s and early 1980s during the proposed groundwater level evaluation period.*

8. With regard to the 1978 to 1982 groundwater level evaluation period, MA states, "Annual precipitation increases are another possible explanation for this increase, so this period is not included as an evaluation period for Valley Water benefits." (MA Letter, Page 2).

   LSCE Response:

   a. *We note that MA states here that they disqualified the 1975/78 to 1982 period as a groundwater evaluation period for Valley Water benefits due to increasing precipitation over this period, even though the following sentence incorrectly cites the groundwater level trend from 1975 to 1982 as demonstrating a benefit from Valley Water.*

9. MA states that the 2001 to 2004 period can be used as a groundwater level evaluation period to show District benefits, and show stable/increasing levels at Stanford Wells 1 and 2 (MA Letter,

Pages 2 and 3).

LSCE Response:

a. *For the period from 1998 to 2004, Stanford groundwater pumping peaked in 2001 and the minimum occurred in 2003. This pumping pattern would cause stabilization of groundwater levels in the Stanford area over the proposed 2001 to 2004 evaluation period due to changes in local pumping rates alone; thus, this period cannot be used by the District to evaluate benefits.*

10. MA states, “We do not dispute LSCE’s observation of the 2011 to 2013 time period being stable to decreasing in water level trends, which is consistent with the evaluation of trends during this time period in the Palo Alto area in the study report.” (MA Letter, Page 3).

LSCE Response:

a. *We note that MA concurs with LSCE that the 2011 to 2013 evaluation period for groundwater levels, which was the only groundwater level evaluation time period used in the original draft ZOB study, and cannot be used to prove a benefit from SCVWD activities.*

11. Under LSCE Response A-4, LSCE essentially argues that MA needs to provide more evidence of a District benefit to Stanford that just saying there is a hydrogeologic connection. MA’s response is that LSCE mischaracterized the ZOB study and cites the following quote from the ZOB report, “If data and modeling are insufficient to assess whether an area benefits from District activities, the following assumptions are made: Benefits from a District activity extend to all areas that are connected by groundwater flow (hydrogeologically connected) to the activity.” (MA Letter, Page 4).

LSCE Response:

a. *The response by MA confirms LSCE’s comment that if a benefit cannot be proved by groundwater level evaluation or modeling, having a hydrogeologic connection is adequate evidence (by itself) to conclude the area receives a District benefit. LSCE has demonstrated through previous and current comments that the groundwater level evaluation and groundwater modeling are not sufficient to prove a benefit to the Stanford (and Palo Alto) area. Thus, the only remaining argument for a benefit is hydrogeologic connection; however, this is not sufficient in and of itself to prove a benefit (but rather is one of multiple requirements to demonstrate a benefit).*

12. MA states that evaluation of benefits from SFPUC RWS water were not included in ZOB study because they are trying to isolate the benefits of District water, and it would be a separate policy discussion to potentially assign credits for basin recharge from other water sources such as SFPUC RWS water (MA Letter, Pages 5 and 8).

LSCE Response:

a. *These points should be clarified in the ZOB study report: that the ZOB evaluation does not actually account for SFPUC RWS water other than acknowledging it exists, and that any such claims of credits from SFPUC RWS would have to be considered by the District as a separate policy decision.*

13. MA states, "We added recognition to this discussion of recovery that occurred in the 1960s after SFPUC surface water supplies replaced Stanford/Palo Alto groundwater pumping." (MA Letter, Page 7).

LSCE Response:

a. *It is important to note that Stanford pumping was not reduced until after 1973. This should be stated in the ZOB study report, and the ramifications of this fact should be incorporate in the assessment of groundwater level evaluation periods.*

14. In referring to how SFPUC water deliveries were accounted for in the analysis, MA states, "This methodology addresses benefits from in-lieu recharge by SFPUC surface water deliveries to the Stanford/Palo Alto area by limiting evaluation periods to when pumping from the areas are stable or increasing." (MA Letter, Page 9).

LSCE Response:

a. *It is not clear how this selection of evaluation periods incorporates or addresses the multiple benefits of SFPUC surface water deliveries.*

b. *LSCE describes elsewhere in this TM that Stanford pumping was decreasing during the 2001 to 2004 evaluation period; thus, this time period is disqualified from use as an evaluation period per the criteria cited by MA above.*

15. MA states, "While there would be natural recharge through streams without Valley Water's managed recharge, it would be far less without our infrastructure, water supplies, and water management." (MA Letter, Page 12).

LSCE Response:

a. *The District/MA somewhat acknowledge but make no attempt to quantify how much stream percolation would/did occur naturally independent of District activities. Natural stream recharge should be quantified and included in the basin water balance as non-District water (i.e., included as part of natural basin recharge).*

Valley Water

Clean Water • Healthy Environment • Flood Protection

September 24, 2019

Mr. Tom Zigterman, Director of Water Resources & Civil Infrastructure
Stanford University
327 Bonair Siding
Stanford, CA 94305-7272

Subject: Response to Luhdorff & Scalmanini's September 13, 2019 Technical Memorandum on the Groundwater Benefit Zone Study

Dear Mr. Zigterman:

Thank you for the technical memo from Luhdorff & Scalmanini Consulting Engineers (LSCE) dated September 13, 2019 responding to the Santa Clara Valley Water District (Valley Water) letter dated August 21, 2019 and Montgomery & Associates (Montgomery) letter dated August 16, 2019. Valley Water also appreciates the in-depth discussion in the September 16, 2019 meeting with you, LSCE, Montgomery, Palo Alto, and Great Oaks Water Company. Below is the Valley Water response to several of the points raised in the LSCE memo.

LSCE Comment 1

LSCE points out that, despite Valley Water's statement that groundwater modeling is not necessary to support the claim of benefits in the Stanford/Palo Alto area, Montgomery refers to support from groundwater modeling in several places. LSCE also states that the groundwater level evaluation does not support the Valley Water benefit to the Stanford/Palo Alto area.

Valley Water did not rely solely on groundwater modeling results to claim the Stanford/Palo Alto areas benefit from Valley Water activities. However, the model provides additional support for the benefits demonstrated by the groundwater level evaluation and hydrogeologic connection between the Stanford/Palo Alto areas and the rest of the groundwater basin. The zone evaluation by Montgomery uses best available data and tools to develop scientifically-sound recommendations and, to our knowledge, goes well beyond what is done to support groundwater zones/charges in other basins.

Valley Water acknowledges that LSCE and Stanford do not agree with the findings of the groundwater level evaluation despite information provided in previous Valley Water and Montgomery responses and discussion at our September 16, 2019 meeting. Valley Water and Montgomery believe that benefits to the Stanford/Palo Alto area have been reasonably demonstrated.

LSCE also had several observations on the Valley Water/Montgomery reference to the model developed by Todd Groundwater (Todd) for the City of Palo Alto's Indirect Potable Reuse (IPR) study. However, several LSCE assertions are based on incorrect assumptions as noted below.

In our previous response, Valley Water/Montgomery noted that the IPR study model (Todd model) was not used for the Groundwater Benefit Zone Study. However, we referenced the model results from that study because it provides additional support for the connection between the Stanford/Palo Alto area and the rest of the groundwater basin. LSCE notes that "inflow across the southern model domain of the Todd model is strictly dependent on the specific assumptions made and incorporated in the general head boundary condition at this location." However, there is no general head boundary at this location in the Todd model. When LSCE requested the model files and additional details, Valley Water suggested LSCE/Stanford contact the City of Palo Alto directly since the Todd model was developed under an agreement between the City of Palo Alto and Todd. The Todd model is not a local model. It is based on Valley Water's Santa Clara Plain groundwater model and extends the Santa Clara Plain model domain to the Redwood City area in the San Mateo Plain. It therefore covers a larger area than Valley Water's Santa Clara Plain groundwater model used in the study.

Valley Water acknowledges that the 2,300 acre-feet inflow shown by the Todd model is for a future scenario that includes 2,500 acre-feet of pumping in the Palo Alto area. While this does not represent current conditions, it is likely more representative of historical conditions when there was more pumping in the Stanford/Palo Alto area and potential conditions in the future should pumping resume.

The reference to the Todd model and IPR study was made to provide additional relevant information that supports the Valley Water determination that the Stanford/Palo Alto areas are connected to, and benefit from, Valley Water groundwater management activities. As acknowledged by LSCE in our September 16, 2019 meeting, if Valley Water activities ceased to occur, groundwater levels in the Stanford area would be lower.

LSCE Comment 2

LSCE questions the Valley Water reference to a Geomatrix report prepared for Stanford University, and claim it supports their assertion of decades of water level recovery following cessation of pumping in the Stanford/Palo Alto area. The Geomatrix report was referenced to provide additional information from an independent source recognizing the interconnected nature of groundwater levels within a large basin, and that groundwater in the Stanford area is affected by regional basin pumping and recharge conditions. Valley Water does not dispute water level recovery in the Stanford wells into the 1980s. However, as we discussed in our September 16, 2019 meeting, Valley Water and Montgomery believe the recovery from the cessation of pumping in the Palo Alto wells due to SFPUC deliveries was dramatic, as evidenced by a steep, increasing slope in water levels over only a few years in the 1960s, corresponding to the dramatic decline in pumping from 5,500 acre-feet per year (City of Palo Alto IPR Study) to zero in 1962. Following that period, the recovery flattens out in the early 1970s. An extended period of recovery for the Palo Alto/Stanford area into the late 1970s is therefore unlikely to be explained by the smaller reduction of Stanford pumping from 1,000 AFY to less than 500 AFY after

1973. It should be noted that many wells in the Santa Clara Valley show recovery from increasing demand and regional overdraft into the 1980s.

LSCE Comment 3

LSCE notes that SFPUC deliveries provide more than just in-lieu recharge by providing direct recharge to the subbasin due to excess irrigation water at residences, parks, and other irrigated lands, and opportunities for use of recycled water within the subbasin. The primary groundwater benefit from SFPUC water is in-lieu recharge. While Valley Water encourages efficient water use, excess irrigation may occur and provide some incidental benefit to groundwater within recharge areas. However, this occurs throughout the recharge area whether the source is SFPUC or Valley Water imported water and the volumes are likely very minor. With respect to LSCE's claim that SFPUC deliveries provide being a benefit to the basin as a source of recycled water, the source of water is not relevant to recycled water benefits because the demand would be met by another source (eg groundwater or Valley Water deliveries) if SFPUC supply was not available.

LSCE Comment 4

LSCE states it remains unclear how the study accounts for the delivery of SFPUC water beyond acknowledging that it occurs and provides in-lieu recharge benefits. This issue was addressed by Montgomery's August 16, 2019 response to Stanford and was discussed at our September 16, 2019 meeting. Limiting the groundwater level evaluation period to times the pumping is stable or increasing excludes periods of decreased pumping (assumed to be due to SFPUC deliveries). This excludes consideration of periods where groundwater level improvements could be explained by SFPUC deliveries.

LSCE Comment 5

Valley Water previously stated: "While the basin benefits from the delivery of SFPUC supplies, the recharge volumes provided by Valley Water managed and in-lieu recharge are far greater." LSCE notes that "it is very important to consider local water budget components that have a much larger and overriding influence on individual well water levels compared to regional water budget components located much further away."

Local water budget components may have a larger influence on individual wells than regional components located further away. However, it does not follow that the regional components have no influence, nor does it confirm that the difference is sufficiently material to suggest exclusion from a zone. The study was designed only to demonstrate whether a benefit from Valley Water activities exists in an area. The District does not believe it is possible with the data and tools currently available to determine the comparative benefit attributable to individual activities within a small area with the level of specificity suggested by the comment.

LSCE Comment 6

LSCE points out that without a level of significance to benefits, Valley Water is arguing that a well user receiving only a small benefit in water levels would pay the same as another receiving a much larger benefit. LSCE goes on to suggest that a level of significance be developed and used to create a discount for areas that benefit the basin by importing non-Valley Water sources or contributing to recharge. Valley Water acknowledges that all well users within a zone pay the same charge; this is required under the District Act. Groundwater is a shared resource and all well users benefitting from similar Valley Water activities should share in the cost. Moreover, Valley Water does not believe that it is possible at this time with the tools and data available to quantify benefits with the precision that LSCE suggests is needed.

LSCE Comment 7

LSCE questions the use of increasing groundwater levels in the late 1970s and early 1980s to demonstrate benefit from Valley Water activities. LSCE contends that this period is an extended recovery from decreased pumping due to the delivery of SFPUC water in the 1960s and early 1970s. This issue was addressed by Montgomery's October 26, 2018 and August 16, 2019 responses and at the September 16, 2019 meeting. The contention that this period represents extended recovery conflicts with the observed rapid rise in groundwater levels in the early 1960s followed by flattening out of the recovery curve that occurred after the cessation of pumping in Palo Alto. An even shorter period of lower magnitude is therefore likely after Stanford's pumping reduction. Valley Water also observed rapid recovery of water levels in other areas of the basin during and following the most recent drought. Valley Water and Montgomery believe the groundwater level evaluation for the 1978-1982 period demonstrates benefit from Valley Water activities.

LSCE Comment 8

LSCE notes that Montgomery stated that natural precipitation is a possible cause to the increasing water levels in the 1975/78 to 1982 time period and that the period isn't used to demonstrate Valley Water benefits. The statement referenced by LSCE refers to the 1969-1975 period after recovery from cessation of Palo Alto levels off so the 1969-1976 period is not used to demonstrate Valley Water benefits. The 1978 to 1982 time period is used to demonstrate Valley Water benefits as stated in the next paragraph after the statement referenced by LSCE: "The groundwater level trend in the Palo Alto and Stanford areas during the 1978-1982 period s increasing and demonstrates the benefit from Valley Water activities in the Palo Alto and Stanford areas.

LSCE Comment 9

LSCE questions the use of the 2001 to 2004 period for demonstrating benefit, stating that Stanford pumping decreased from a peak in 2001 and reached a minimum in 2003. The study had not shown this trend in Stanford pumping because two Stanford wells are in Palo Alto's delivery area and were grouped with Palo Alto pumping. Montgomery agrees that pumping areas should be redefined such that Stanford pumping area includes all the Stanford pumping. The declining Stanford area pumping from 2001 to 2004 removes that period from being evaluated. The groundwater level trend evaluation demonstrates a benefit in the Stanford area from Valley Water activities from the 1978-1982 period but does not identify benefits specifically to managed recharge or treated water deliveries.

LSCE Comment 10

This comment notes an area of agreement regarding the 2011 to 2013 time period – comment noted.

LSCE Comment 11

LSCE stated Montgomery's previous response confirms the LSCE comment that "if a benefit cannot be proved by groundwater level evaluation or modeling, having a hydrogeologic connection is adequate evidence (by itself) to conclude the area receives a District benefit." LSCE goes on to say that hydrogeologic connection "is not sufficient in and of itself to prove a benefit (but rather is one of multiple requirements to demonstrate a benefit)."

Although the Study did not rely on hydrogeologic connection to demonstrate a benefit, the connection provides sufficient demonstration that an area is receiving benefit. This is consistent with the definition of a basin and the requirements for establishing a zone. As noted in Montgomery's review of the methods that other agencies have used to establish groundwater benefit zones, they rely on subbasin areas or delivery areas. Valley Water's approach to establishing the zones, which also incorporates groundwater level analysis and modeling results, goes above and beyond what is required.

LSCE Comment 12

LSCE states that the study report should state that the "evaluation does not actually account for SFPUC RWS water other than acknowledging it exists, and that any such claims of credits from SFPUC RWS would have to be considered by the District as a separate policy decision." Per our response to comment 4, Valley Water does not agree that the study did not account for SFPUC deliveries. As we have discussed, issues about non-Valley Water activities or groundwater rates such as credits or discounts are separate policy decisions that are beyond the scope of the study. Like previous comments and responses, these recent LSCE/Stanford comments will be included in the final Groundwater Benefit Zone Study report.

LSCE Comment 13

LSCE states that Stanford pumping was not reduced until 1973 and that the study should include this information and incorporate it into the assessment of the groundwater level evaluation periods. As described in response to Comment 9, the analysis has been revised to group Stanford well pumping together even though two wells are in the Palo Alto delivery area. The analysis now reflects a reduction of pumping from 1972-1973 pumping to lower amounts through 1982. As described above, the pattern of recovery response to the much greater reduction of pumping by Palo Alto in 1962 indicates that recovery from reduction by Stanford would have leveled off by the 1978-1982 evaluation period. Therefore, the observed increase during 1978-1982 can be attributed to Valley Water activities. Pumping information from before 1972 was not available to Valley Water during the study despite requests for information from the water retailers and others throughout this process.

LSCE Comment 14

LSCE states that is remains unclear how the study accounts for the multiple benefits from SFPUC deliveries and that decreased pumping by Stanford during the 2001 to 2004 period should be accounted for. Valley Water responded to these items under comments 4 and 9 above.

LSCE Comment 15

LSCE states that “natural stream recharge should be quantified and included in the basin water balance as non-District water (i.e., included as part of natural basin recharge).” Natural recharge is quantified and accounted for separately from Valley Water managed recharge in the water balance presented in Chapter 6 of the preliminary study report.

Staff plans to present the recommendations and the outcome of the September 16, 2019 meeting to the Valley Water Board of Directors on October 8, 2019. More information will be available at https://www.valleywater.org/how-we-operate/board-meetings-agendas-minutes. Thank you again for your interest in the study, and for taking the time to meet with us and provide feedback. If you have any questions, please contact me at (408) 630-2964 or gcook@valleywater.org.

Sincerely,

George S Cook Jr

George Cook, P.G.
Senior Water Resources Specialist
Groundwater Management Unit

cc: Cameron Tana, Montgomery & Associates
N. Hawk, G. Hall, V. De La Piedra

Stanford University
Sustainability and Energy Management
Water Resources & Civil Infrastructure
315 Bonair Siding, 2ND Floor
Stanford, CA 94305-7272

Valley Water - Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118-3686

October 8, 2019

Subject: Zones of Benefit Study – Stanford comments on Valley Water's letter dated September 24, 2019

Dear George:

This letter transmits our responses to your September 24 letter. Hopefully, this technical review information will substantiate our contention that the Study does not demonstrate the benefit of Valley Water's recharge activities to the north county area. We had already agreed that two of the three event periods that were initially used to conclude benefit to the north county are actually inconclusive; and the third period is also inconclusive if you look at pumping and rainfall data, as described in our review comments. Further, the Study did not identify and evaluate other significant factors and activities that affect changes in groundwater levels, such as fluctuations in annual rainfall and impoundment of stormwater runoff and diverted surface water and managed percolation of that water in an unconfined zone. You are therefore left with a Study that does not consider all relevant factors, and is inconclusive at best about benefit in the north county from Valley Water's activities.

As was stated by Valley Water staff at our meeting last month, the Study was structured to look at only Valley Water activities, and to only look at whether there could be any benefit at all from Valley Water's activities; in short, the Study concluded that there is benefit if the area overlies the groundwater basin. Further, no attempt was made to recognize even order-of-magnitude differences in extent of benefit from District activities, which becomes starkly evident as you move into the north county area. Notwithstanding staff's defense of the Study, a gradation of benefits analysis is both feasible and fair, and has been performed by other water districts in California. The Study should be expanded to take into account the relative extent and magnitude of benefits from other factors and activities that account for groundwater recharge and recovery, besides just Valley Water's activities. These factors and activities must be recognized in the mapping of benefit zones. Stanford is willing to work with Valley Water to evaluate the technical information to substantiate and quantify these other factors and activities.

We also encourage staff to recognize the benefits to the groundwater basin that result from recharge activities by others, including Stanford, such as use of imported water and local groundwater recharge and conjunctive use activities, and consider development of a mechanism and policy to account for them in the determination of groundwater pumping charges, possibly as a credit or offset to Valley Water's groundwater fee. For example, Stanford causes groundwater recharge through its investments in infrastructure to capture foothills runoff in Lagunita and to divert surface water and lake water filter backwash water to Lagunita, which percolates directly into the San Francisquito Creek Cone and groundwater basin. The staff report identifies challenges to such a process, but acknowledges that this is a viable concept and requests Board direction. We believe such groundwater recharge activities should be encouraged and recognized through a mechanism of analysis and quantification and offsets to groundwater pumping charges.

We hope that the Board will provide direction to staff to work further with stakeholders on:

1. A comprehensive determination of benefit considering all factors and others' activities;
2. Recognizing and developing a gradation of benefits approach;
3. Developing a methodology for offsets or credits to recognize local investment in groundwater recharge activities which, incidentally, is precisely what Valley Water funds through its groundwater fee.

We look forward to continuing to work with you on these important issues.

Sincerely,

Tom W. Zigterman

Tom W. Zigterman
Director – Water Resources & Civil Infrastructure

c: Rob Donlan, Ellison, Schneider, Harris and Donlan
Pete Leffler, LSCE

Luhdorff & Scalmanini
Consulting Engineers

Technical Memorandum

DATE: October 7, 2019 PROJECT: 14-2-067

TO: Tom Zigterman
Stanford University

FROM: Peter Leffler

SUBJECT: **PRELIMINARY RESPONSES TO VALLEY WATER LETTER DATED SEPTEMBER 24, 2019**

INTRODUCTION

This Technical Memorandum (TM) provides our preliminary responses to a letter from Valley Water dated September 24, 2019, which is responding to a LSCE TM dated September 13, 2019. The comments below are not comprehensive and only attempt to address the primary issues raised in the Valley Water letter.

SUMMARY

The Zone of Benefits study purports to rely on three lines of evidence to demonstrate a benefit in the Stanford/Palo Alto area from Valley Water activities: 1) groundwater modeling: 2) groundwater level evaluation: and 3) hydrogeologic connection. Stanford/LSCE provided several comments on the groundwater modeling conducted for the draft ZOB study in our May 2018 letter/TM, which have not been responded to by Valley Water (because the model is not relied upon to demonstrate a benefit). Thus, the groundwater model used in the ZOB study is inadequate for demonstrating benefits. The draft ZOB study started out with one groundwater level evaluation time period to demonstrate benefits (2011-2013) in the Stanford area, but then a subsequent draft added two additional groundwater level evaluation periods (1978-1982 and 2001-2004) after Stanford/LSCE demonstrated that 2011-2013 was not a valid evaluation period. It has subsequently been demonstrated in Stanford/LSCE letters/TMs (including this one) that neither the 1978-1982 nor the 2001-2004 time periods are valid for groundwater level evaluation, which is likely why these two time periods were not selected in the original draft report. Valley Water subsequently agreed 2001-2004 is not a valid evaluation period, and this TM further demonstrates that 1978-1982 is not a valid period. Thus, the groundwater level evaluation analysis for the Stanford/Palo Alto is inconclusive at best and clearly is insufficient to demonstrate benefits. Hydrogeologic connection, which should be considered a requirement along with an additional line of evidence to demonstrate a benefit, was not fully evaluated for the Stanford/Palo Alto area. If hydrogeologic connection alone were sufficient, the ZOB study served no purpose.

PRELIMINARY REVIEW COMMENTS

1. In response to LSCE Comment 1, Valley Water states that groundwater modeling provides additional support for the benefits demonstrated by the groundwater level evaluation. Valley Water also cites acknowledgement by LSCE at our September 16, 2019 meeting that, "…if Valley Water activities ceased to occur, groundwater levels in the Stanford area would be lower."

   LSCE Response:
   The current letter from Valley Water is in conflict with the previous letter from Valley Water (August 16, 2019), which states groundwater model results are not being relied upon to demonstrate a benefit in the Stanford area. Regardless, Valley Water has not responded to numerous comments and concerns expressed by Stanford/LSCE in our previous review comments (May 2018) regarding the groundwater modeling tool described in the ZOB study. With regard to the note about water levels being lower in the Stanford area without Valley Water activities, Stanford/LSCE recall this conversation somewhat differently. Stanford stated that ceasing Valley Water recharge activities would have no detrimental effect on the Stanford area. LSCE commented that ceasing Valley Water recharge activities may result in a groundwater flow direction towards the south assuming groundwater pumping in the middle to southern portion of the county was at pre-1970 levels and Stanford/Palo Alto had essentially no pumping in the north county area (this statement also assumes hydrogeologic connection exists, which is not fully evaluated in the ZOB study). Regardless, this Valley Water comment is taken out of context of the primary themes of our discussions at the meeting. The context of the discussion was really about why Stanford/Palo Alto, whose benefit from Valley Water activities (if it exists at all) is so small that it could not be demonstrated in the Zone of Benefits study, should pay the same fee as others who receive benefits of 100 feet or more? There are multiple orders of magnitude difference in benefits (assuming a benefit even exists), which was not denied by Valley Water or its consultants at the meeting, and the benefits received by Stanford/Palo Alto effectively have no benefit to their respective well operations. In fact, any incremental benefit of Valley Water activities, if it does exist, is likely detrimental in the Palo Alto area where dewatering operations are common due to shallow groundwater levels.

2. In response to LSCE Comment 1, Valley Water states, "The Todd model is not a local model. It is based on Valley Water's Santa Clara Plain groundwater model…"

   LSCE Response:
   Stanford/LSCE has previously commented extensively (in May 2018) on Valley Water's Santa Clara Plain groundwater model. Valley Water has elected not to respond to those comments, and noted in its letter dated August 21, 2019 that the groundwater model is not being relied upon to demonstrate a benefit in the Stanford/Palo Alto area. Given that the Todd Model is just a slightly revised version of the Santa Clara Plain groundwater model, those previous comments remain applicable and unaddressed. Thus, the groundwater model cannot be relied upon to demonstrate a benefit in the Stanford/Palo Alto area.

3. In response to LSCE Comment 2, Valley Water attempts to cite a rationale for why the water level recovery from 1962 until the mid-1980s is no longer influenced after the mid-1970s by reductions in pumping by Palo Alto and Stanford that occurred from 1962 to 1973.

   LSCE Response:
   There are a couple key points of clarification here. While Valley Water cites a decrease in Stanford pumping from "1,000 AFY to less than 500 AFY", the reality is that pumping declines from as much as 2,100 AFY to less than 500 AFY after 1973. The average Stanford pumping from 1963 to 1973 was 1,700 AFY, whereas the average Stanford pumping from 1974 to 1982 was 130 AFY. Thus, the abrupt decline in Stanford groundwater pumping amounted to more than 1,500 AFY of decreased groundwater pumping after 1973. Furthermore, this amount of pumping by Stanford extended back in time to the late 1940s, or a time period of approximately 25 years. Basic hydrogeologic principles dictate that it is not reasonable to expect full recovery of local groundwater levels from 25 years of significant pumping in less than five years. The second point is that LSCE was not saying all recovery after 1973 was due to Stanford pumping reductions alone; but rather a combination of even greater pumping reductions by Palo Alto that started in the 1960s plus reductions in pumping by Stanford that started in the 1970s. The combined total pumping reductions by Palo Alto and Stanford amounted to approximately 7,500 AFY during the 1960s and 1970s, a major change in the local pumping regime that was still causing local groundwater level recovery after 1977.

4. In response to LSCE Comment 5, Valley Water states, "The District does not believe it is possible with the data and tools currently available to determine the comparative benefit…" Valley Water makes this same argument in response to LSCE Comment 6.

   LSCE Response:
   If Valley Water were to address previous comments (and make appropriate model revisions) made by Stanford/LSCE in May 2018 on the groundwater model described in the ZOB study, the necessary tools and data would exist to delineate comparative benefits.

5. In response to LSCE Comment 7, Valley Water argues that increasing groundwater levels in the late 1970s to early 1980s are due to Valley Water activities. In response to LSCE Comment 8, Valley Water notes that increases in precipitation result in a period not being valid for groundwater level evaluation in the ZOB study.

   LSCE Response:
   While Stanford/LSCE strongly disagree with Valley Water conclusions regarding the cause of local water level recoveries in the Stanford/Palo Alto area with respect to changes in local pumping vs. Valley Water activities, there are other important data relevant to this discussion not previously addressed in the ZOB study. The attached figures (Figures 1 through 10) demonstrate that there was a severe drought in the three years immediately preceding 1978 (approximately 60% of normal rainfall), and then the 1978-1982 period had well above normal rainfall (approximately 120% of normal rainfall). These dramatic differences in rainfall would be expected to have significant effects on water levels during the 1978-82 period, and make this

time period invalid for ZOB study groundwater level evaluation. Overall, it is clear that dramatic declines in groundwater pumping by Palo Alto/Stanford in the 1960s/1970s and dramatic increases in rainfall from before to after 1978 account for the increases in groundwater levels in the Palo Alto/Stanford area from 1978 to 1982. Thus, the 1978-1982 time period cannot be used to demonstrate benefits from Valley Water activities in the Palo Alto/Stanford area.

6. Valley Water's response to LSCE Comment 7 also states, "The contention that this period represents extended recovery conflicts with the observed rapid rise in groundwater levels in the early 1960s followed by flattening out of the recovery curve that occurred after the cessation of pumping in Palo Alto."

   LSCE Response:
   Valley Water is referring to the 1970-72 period when they reference flattening out of the recovery curve in this statement. However, the attached figures (Figures 1 through 10) clearly demonstrate 1970-72 was a very dry period with 60% of normal rainfall, which would account for any temporary flattening of water levels claimed by Valley Water. While temporary/intermittent fluctuations in groundwater levels may coincide with short-term fluctuations in rainfall, the overall trend of water levels in all the wells clearly shows no flattening of the trend from 1962 through 1983.

7. In response to LSCE Comments 9 and 10, Valley Water acknowledges that the 2001-2004 and 2011-2013 time periods previously used for groundwater level evaluation in the Stanford/Palo Alto area are not valid periods for such an evaluation.

   LSCE Response:
   Stanford/LSCE concur with these updated findings/conclusions by Valley Water.

8. In response to LSCE Comment 11, Valley Water states that hydrogeologic connection alone is sufficient to include Stanford/Palo Alto in the Zone of Benefits, and that the groundwater level evaluation and groundwater modeling efforts in the ZOB study go beyond what is necessary.

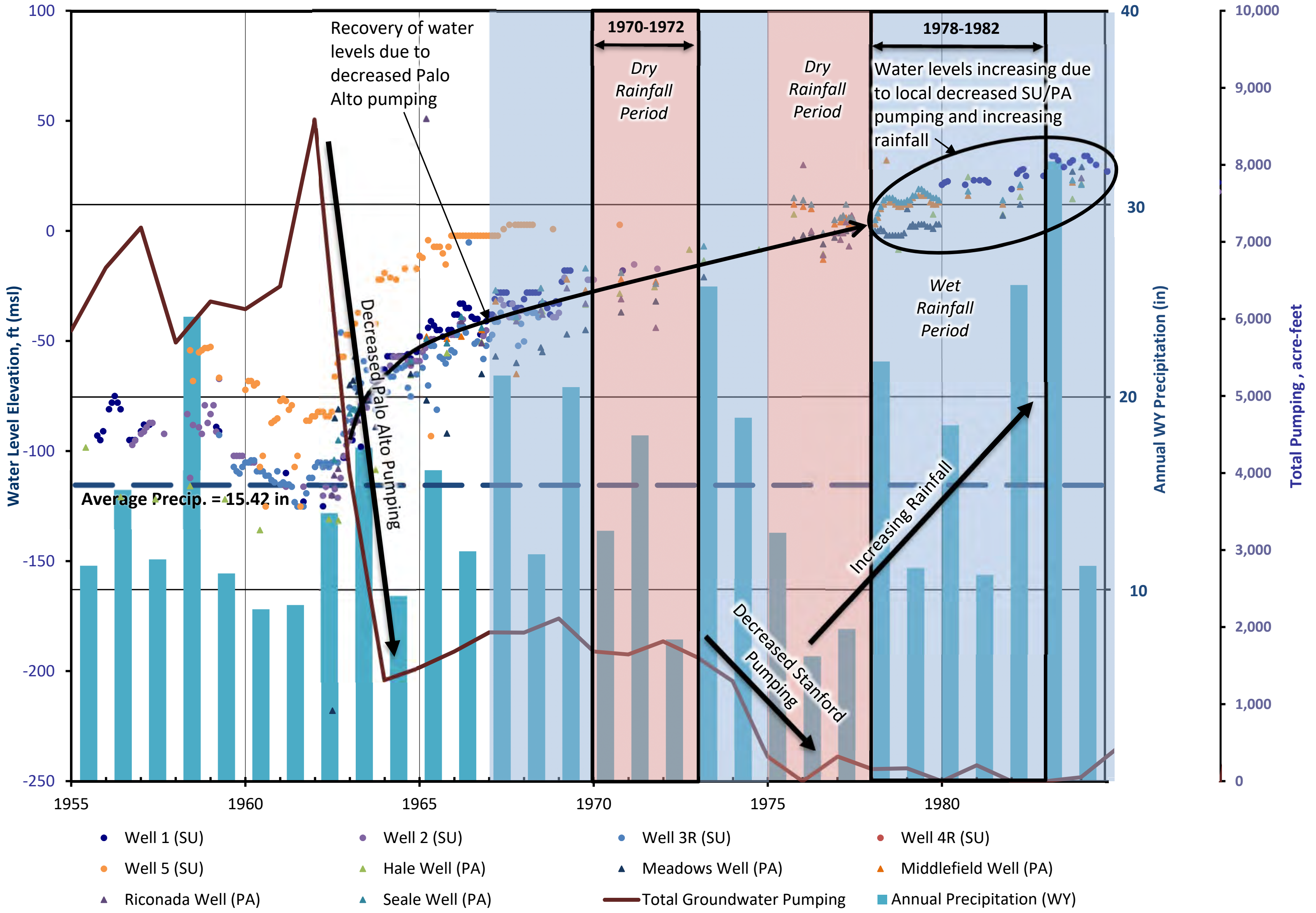
   LSCE Response:
   Valley Water has not evaluated the important characteristics of the San Francisquito Cone with regard to hydrogeologic connection. There are key geologic and hydrogeologic features of this alluvial cone relative to the discussion of hydrogeologic connection, most importantly the occurrence of abundant coarse-grained alluvial deposits that do not occur to the north or south of the San Francisquito Cone. In addition, this Valley Water response leads to a question posed in previous LSCE comments: what is the purpose of all the analyses related to groundwater modeling and groundwater level evaluation periods in the ZOB study if all that is needed to demonstrate a benefit is hydrogeologic connection?

9. In response to LSCE Comment 15, Valley Water states that natural recharge from stream infiltration (in the absence of Valley Water activities) is accounted for in Chapter 6 of the report.

LSCE Response:

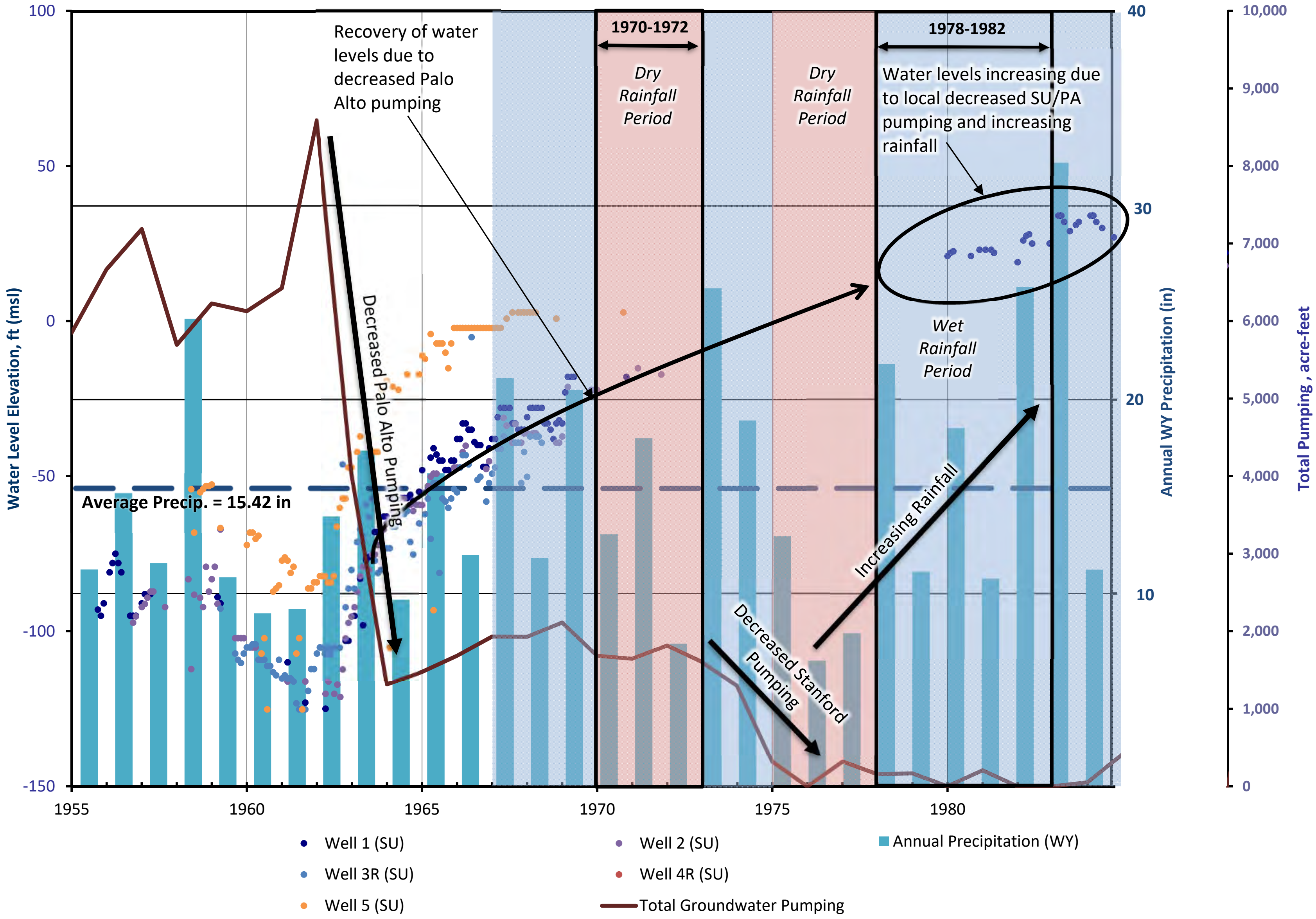
Chapter 6 of the ZOB study provides no details as to how the natural recharge from streamflow infiltration was calculated. The primary recharge component during pre-development conditions in the Santa Clara Plain Subbasin was likely streamflow infiltration. If Valley Water managed recharge activities did not occur today, there would still be substantial natural recharge along the many streams flowing into Santa Clara Plain from the surrounding hills. While Valley Water activities certainly increase the amount of natural streamflow infiltration that would otherwise occur, it is likely that natural streamflow recharge is greater than what may be accounted for in the gross water budget numbers reported in Chapter 6 of the ZOB study.

Attachments: Figures 1 through 10

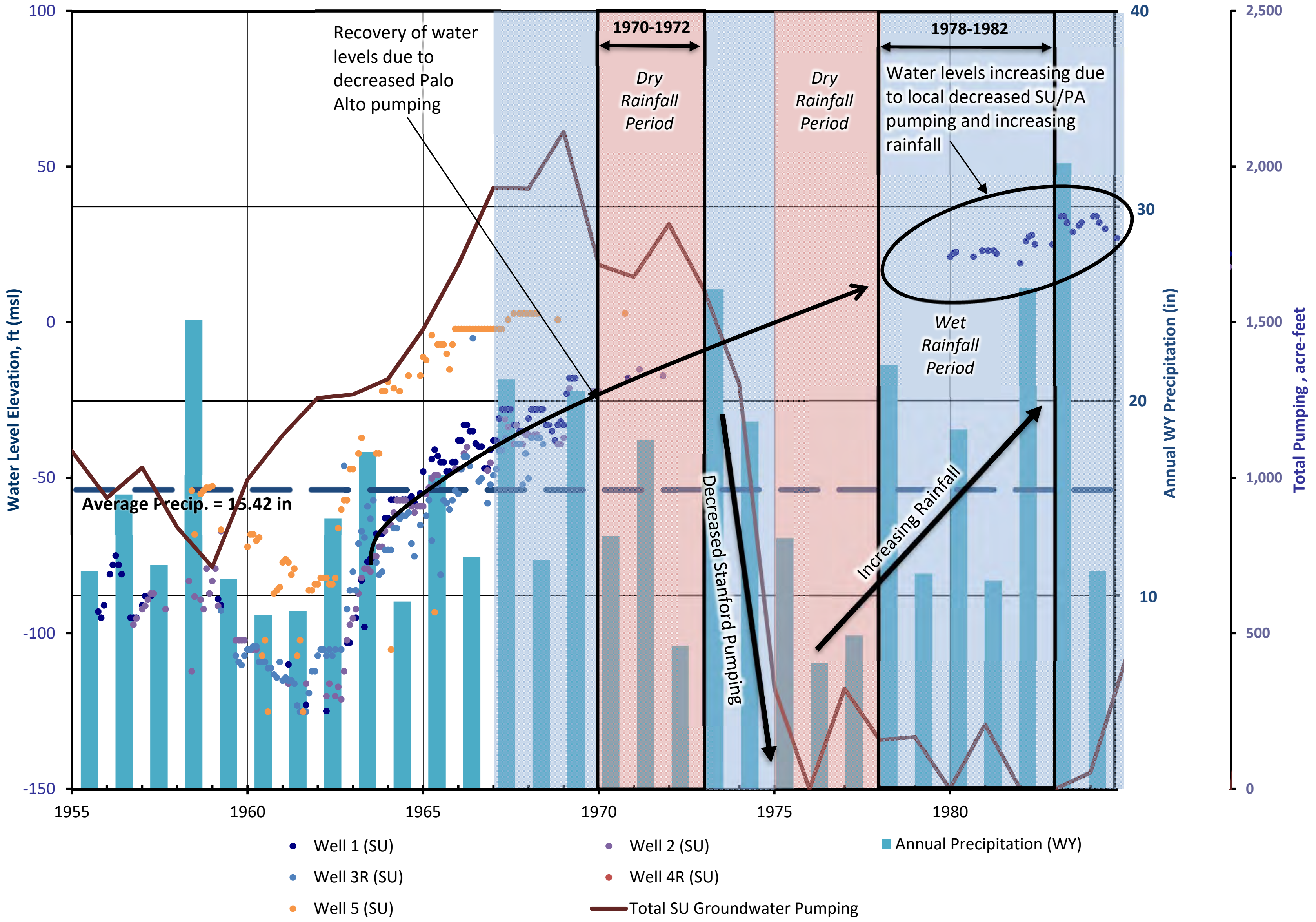


LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Combined Wells Groundwater Level Elevations
Combined Stanford and Palo Alto Pumping
Figure 1

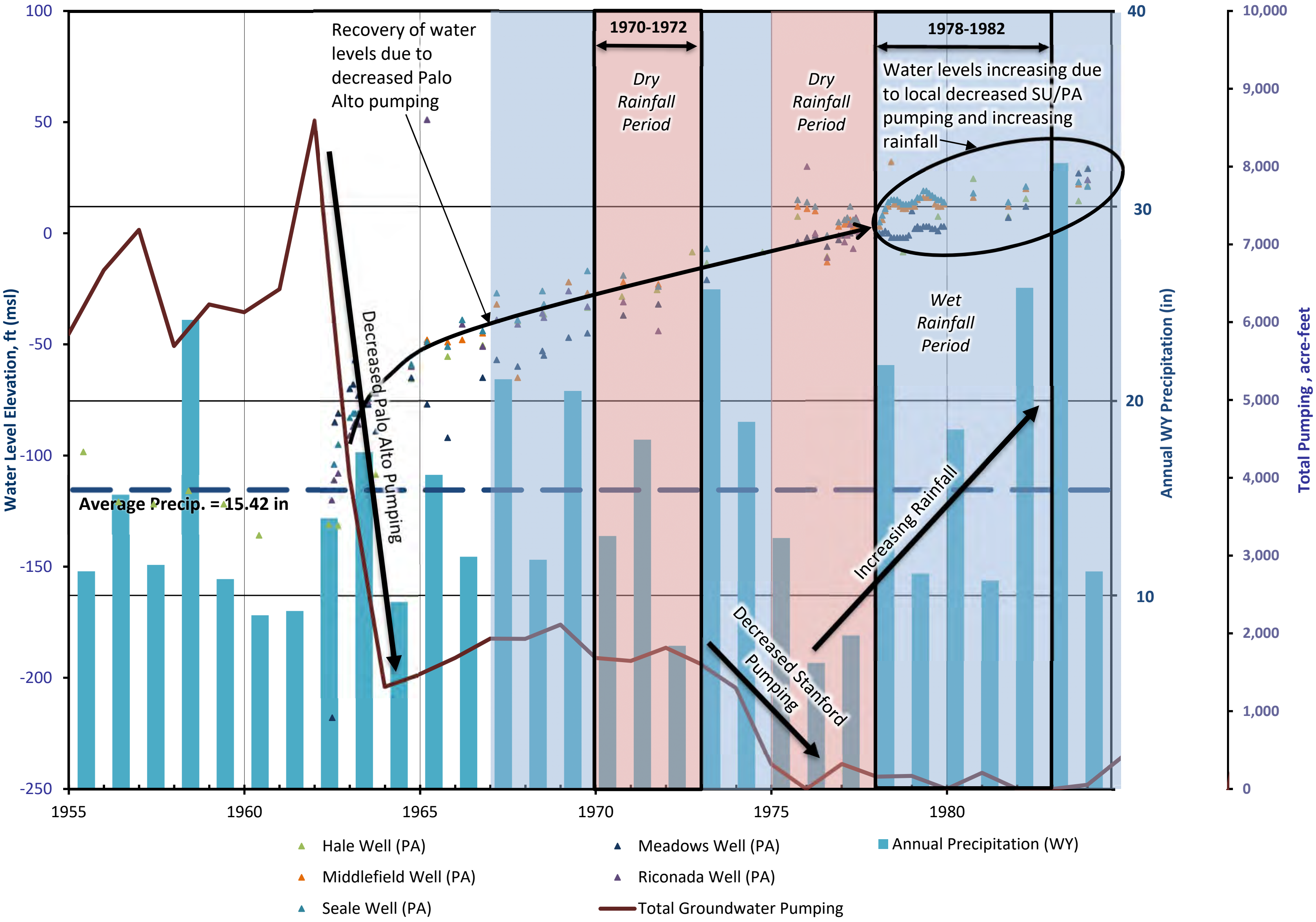


Stanford Well Groundwater Level Elevations
Combined Stanford and Palo Alto Pumping
Figure 2



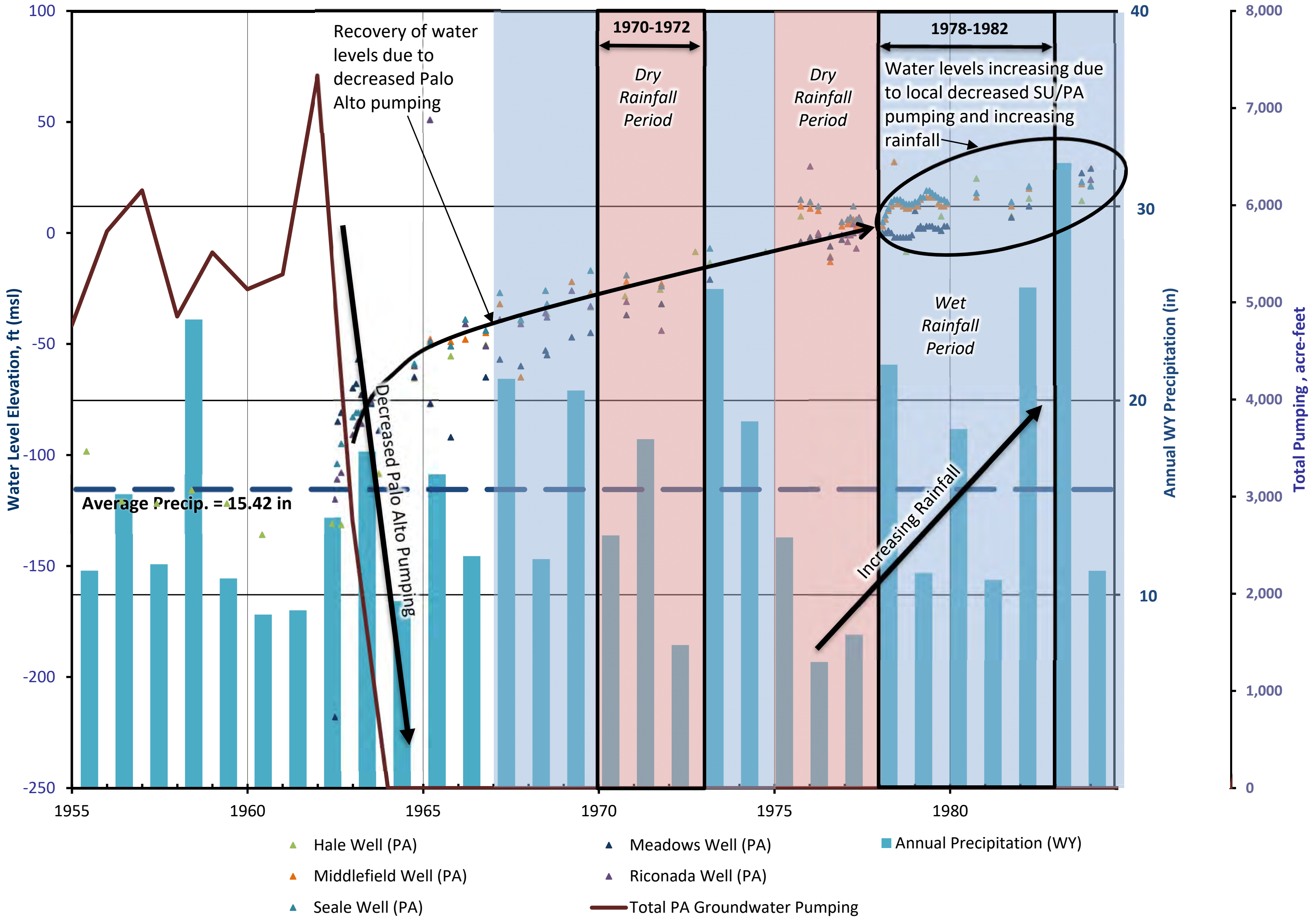
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Stanford Well Groundwater Level Elevations
Stanford Pumping
Figure 3



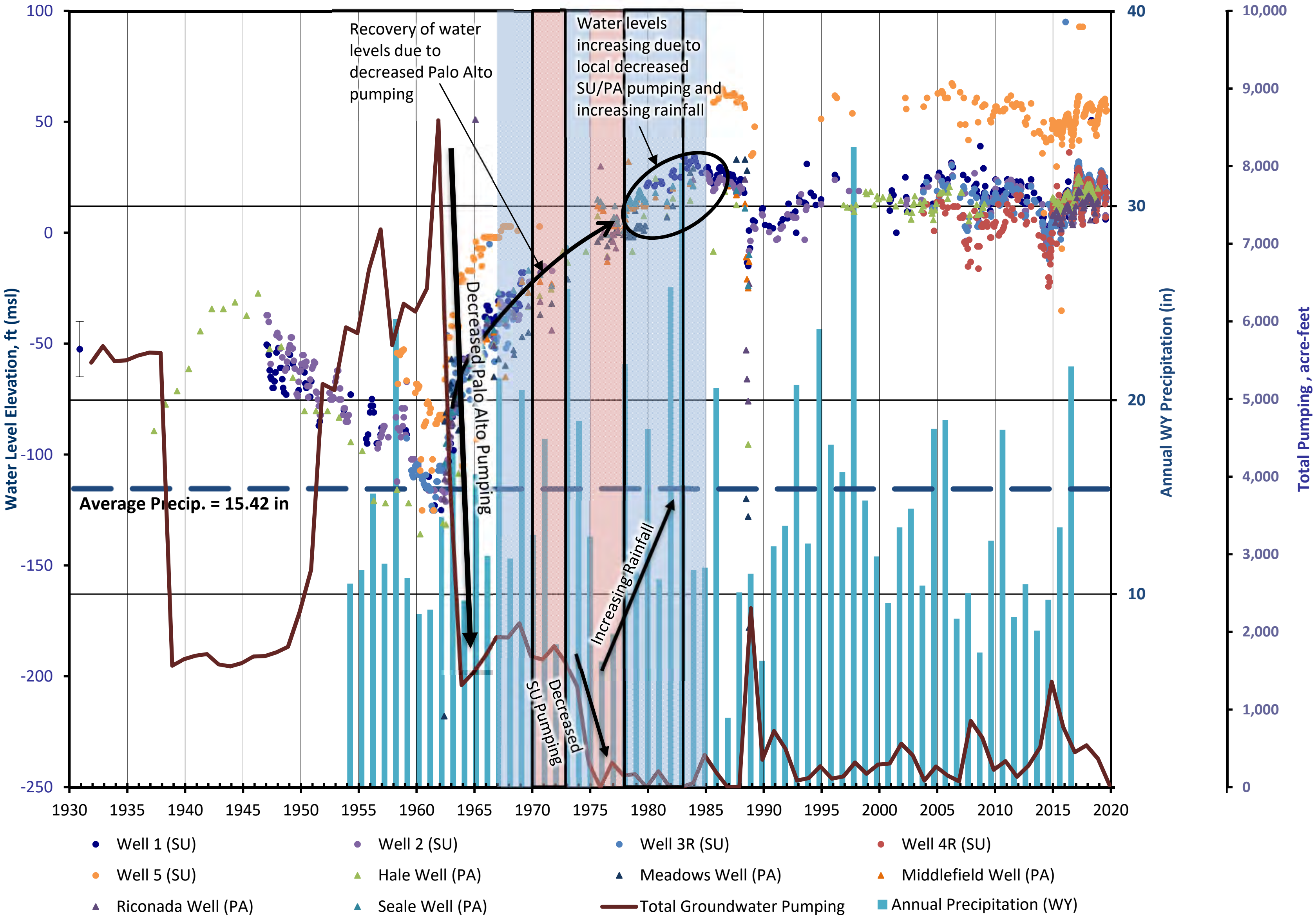
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Palo Alto Well Groundwater Level Elevations
Combined Stanford and Palo Alto Pumping
Figure 4



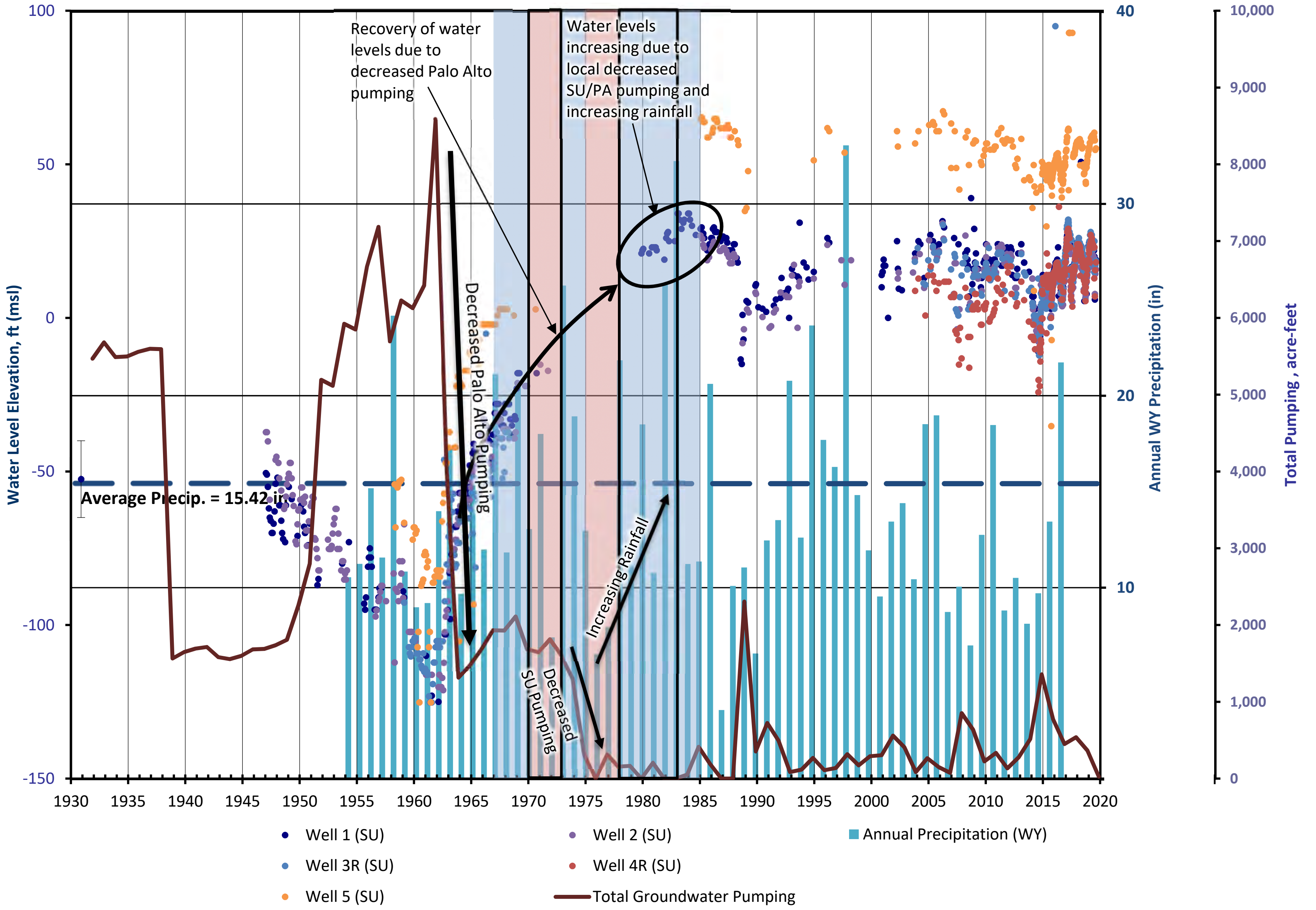
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Palo Alto Well Groundwater Level Elevations
Palo Alto Pumping
Figure 5



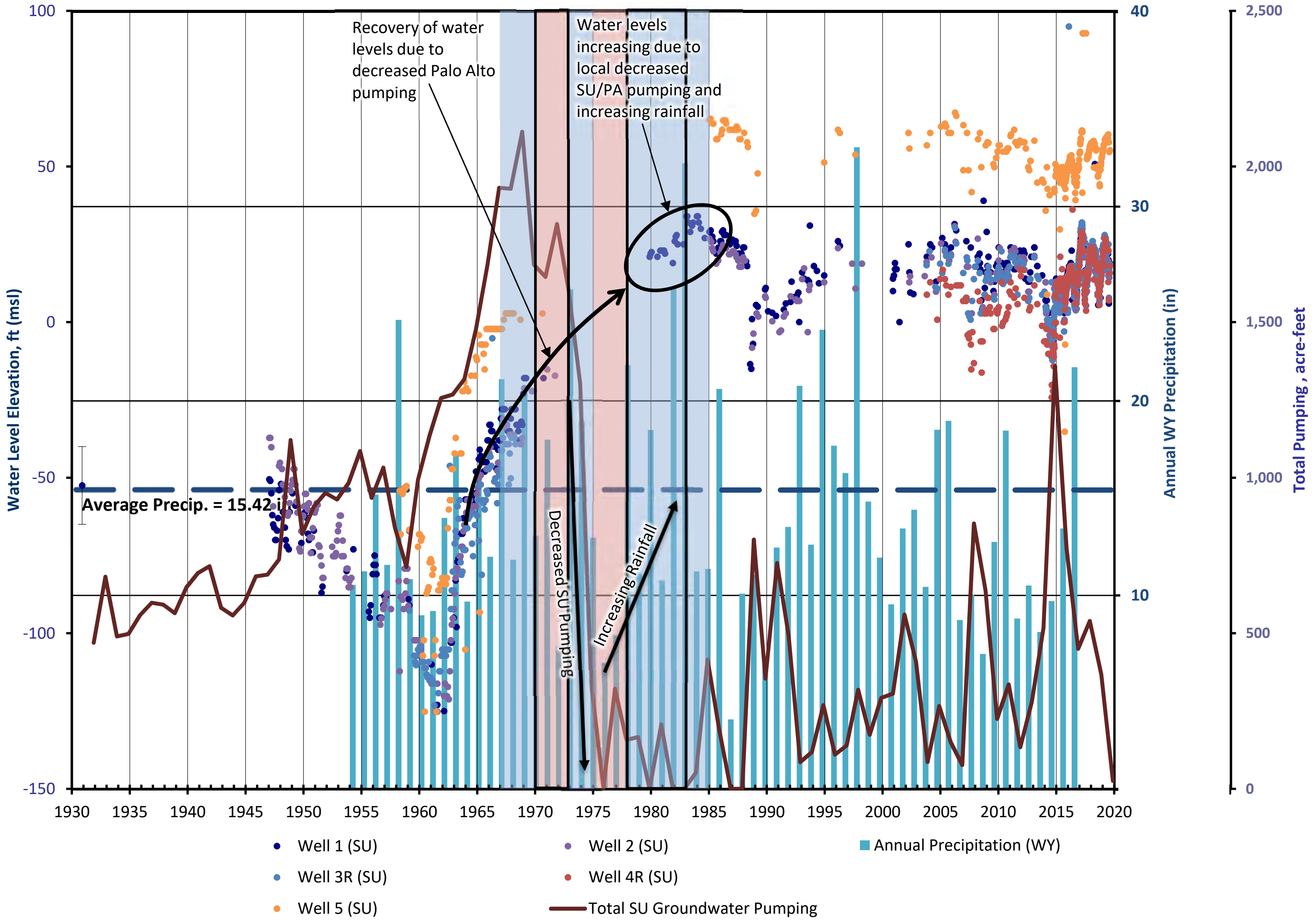
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Combined Wells Groundwater Level Elevations
Combined Stanford and Palo Alto Pumping
Figure 6



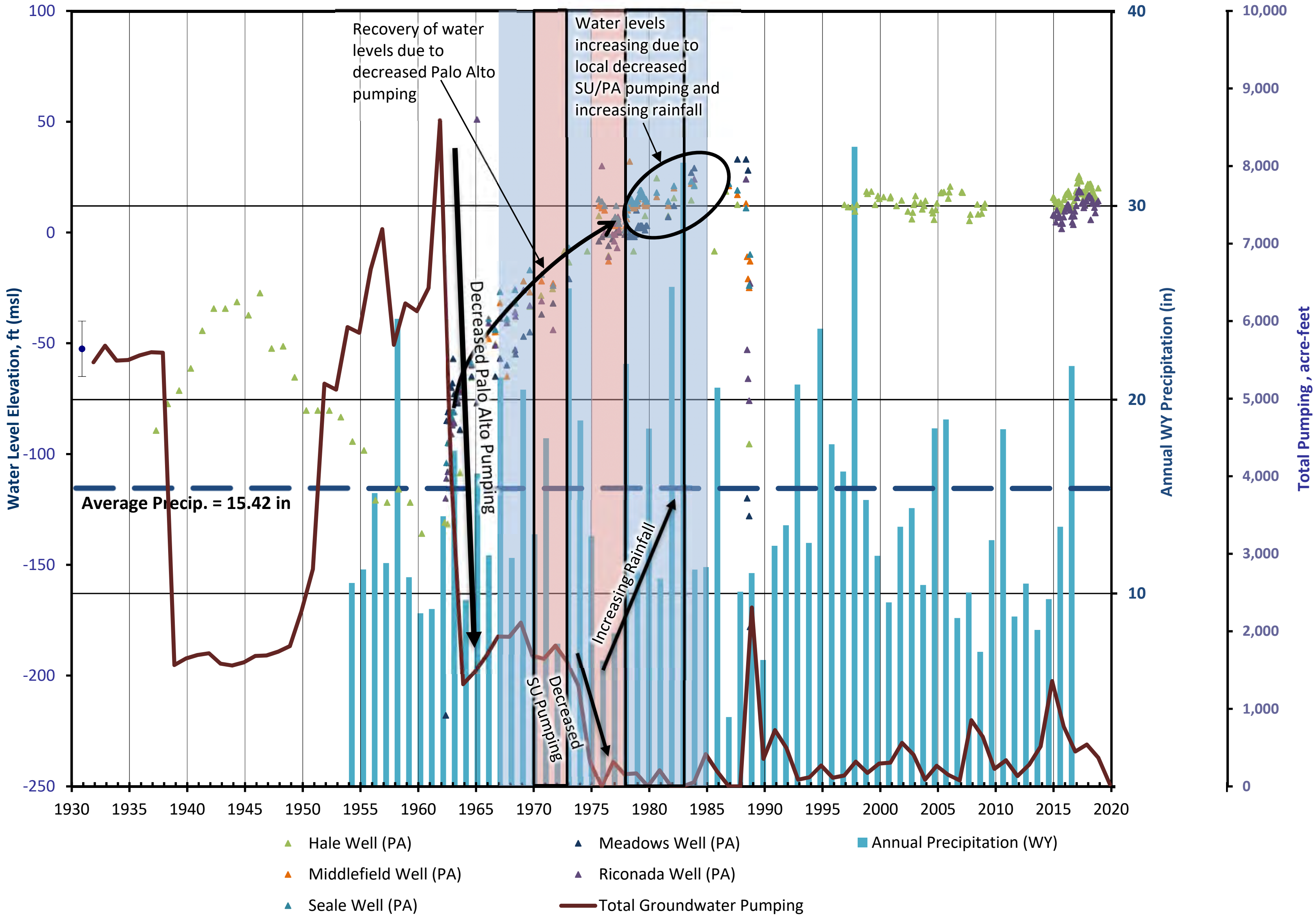
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Stanford Well Groundwater Level Elevations
Combined Stanford and Palo Alto Pumping
Figure 7



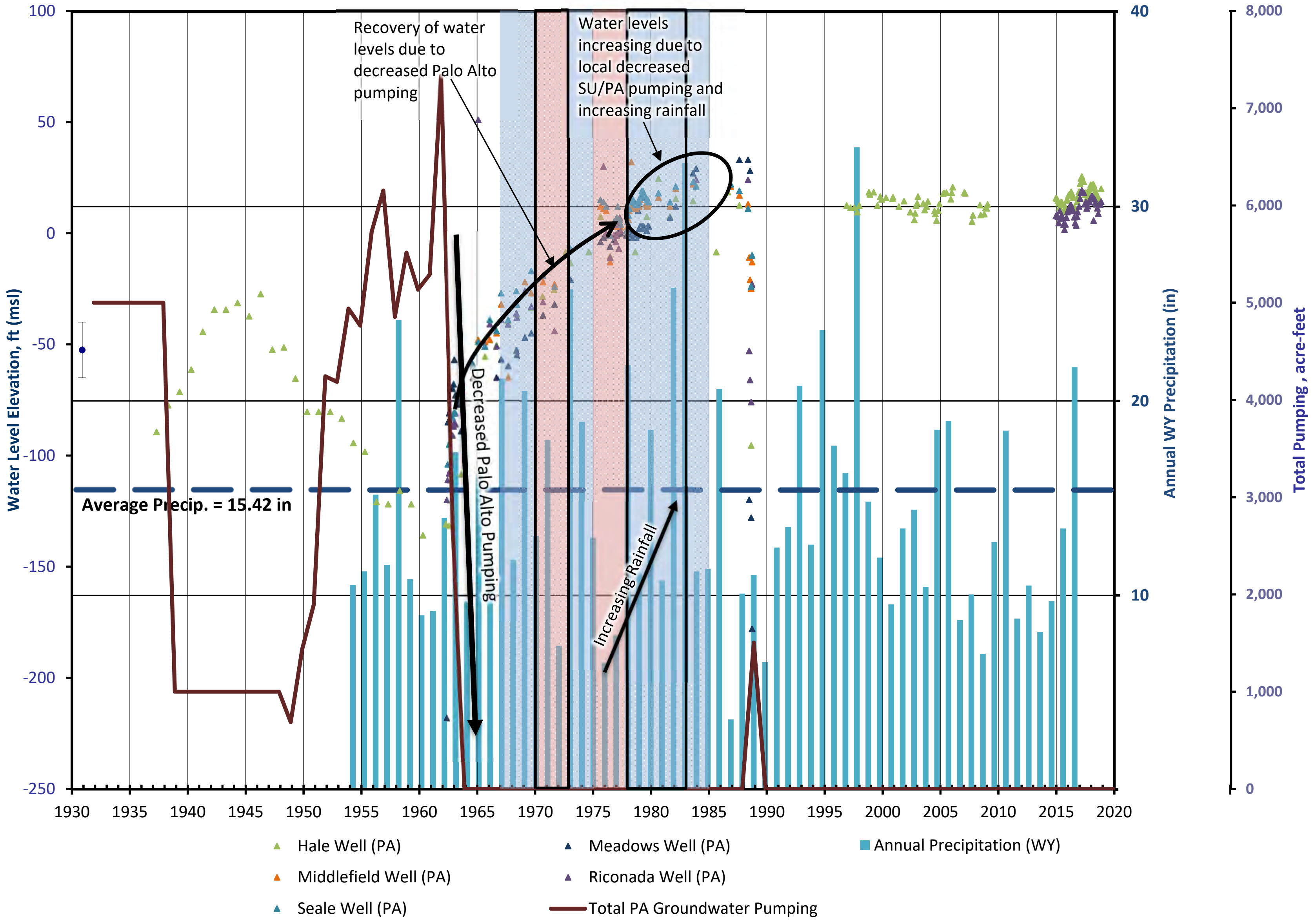
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Stanford Well Groundwater Level Elevations
Stanford Pumping
Figure 8



LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Palo Alto Well Groundwater Level Elevations
Combined Stanford and Palo Alto Pumping
Figure 9



LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Palo Alto Well Groundwater Level Elevations
Palo Alto Pumping
Figure 10

Stanford University

SUSTAINABILITY AND ENERGY MANAGEMENT

Vanessa De La Piedra, P.E., Unit Manager *via email to vdelapiedra@valleywater.org* April 24, 2020
Groundwater Monitoring and Analysis Unit
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

Subject: April 28, 2020 Board of Directors Meeting – Agenda Items 2.3 and 2.4

Dear Ms. De La Piedra:

Stanford University ("Stanford") offers these summary comments on agenda items 2.3 and 2.4 for the April 28, 2020 meeting of the Board of Directors ("Board") of the Santa Clara Valley Water District ("District"). As detailed in the staff reports and supporting documents for agenda items 2.3 and 2.4, those matters relate to the District's groundwater benefit zones and the Groundwater Benefit Zone Study ("Benefit Study") conducted by the District. For many years now Stanford and the District have been engaged in an ongoing discussion regarding the relative benefits to the Stanford and North County area from the District's activities in the Santa Clara Subbasin ("Subbasin"). As evidenced in Stanford's previously submitted comments and correspondence regarding the Benefit Study, Stanford disputes the District's position that the Stanford area benefits from District activities in the Subbasin and that Stanford is properly included in the District's Zone W-2. The technical evidence demonstrates that: (1) District activities in the southern portion of the Subbasin do not benefit groundwater conditions in the Stanford area; and (2) the activities and actions of Stanford and others in the northern portion of the Subbasin (e.g., importation of surface water from the San Francisco Public Utilities Commission and reduced groundwater pumping) are responsible for maintaining and protecting groundwater conditions in the Stanford area. (See, Attachment A – hydrograph showing the impact of imported water projects on groundwater levels in the Subbasin.) With respect to the latter point, the technical evidence shows that total groundwater recharge in the Stanford area far exceeds the amount of groundwater supply pumping in the area (by Stanford and others). Stanford intends to meet with District staff to provide and discuss additional technical analysis related to the points noted above.

Stanford respectfully requests that the Board remove the Stanford area from District groundwater benefit zones and terminate groundwater production charges in the Stanford area. Further, Stanford requests that any resolution adopting the boundaries of a groundwater benefit zone include language providing for the future review and revision of the boundaries in accordance with hydrogeologic data supporting such review and revision.

Thank you for your consideration of this matter.

Sincerely,

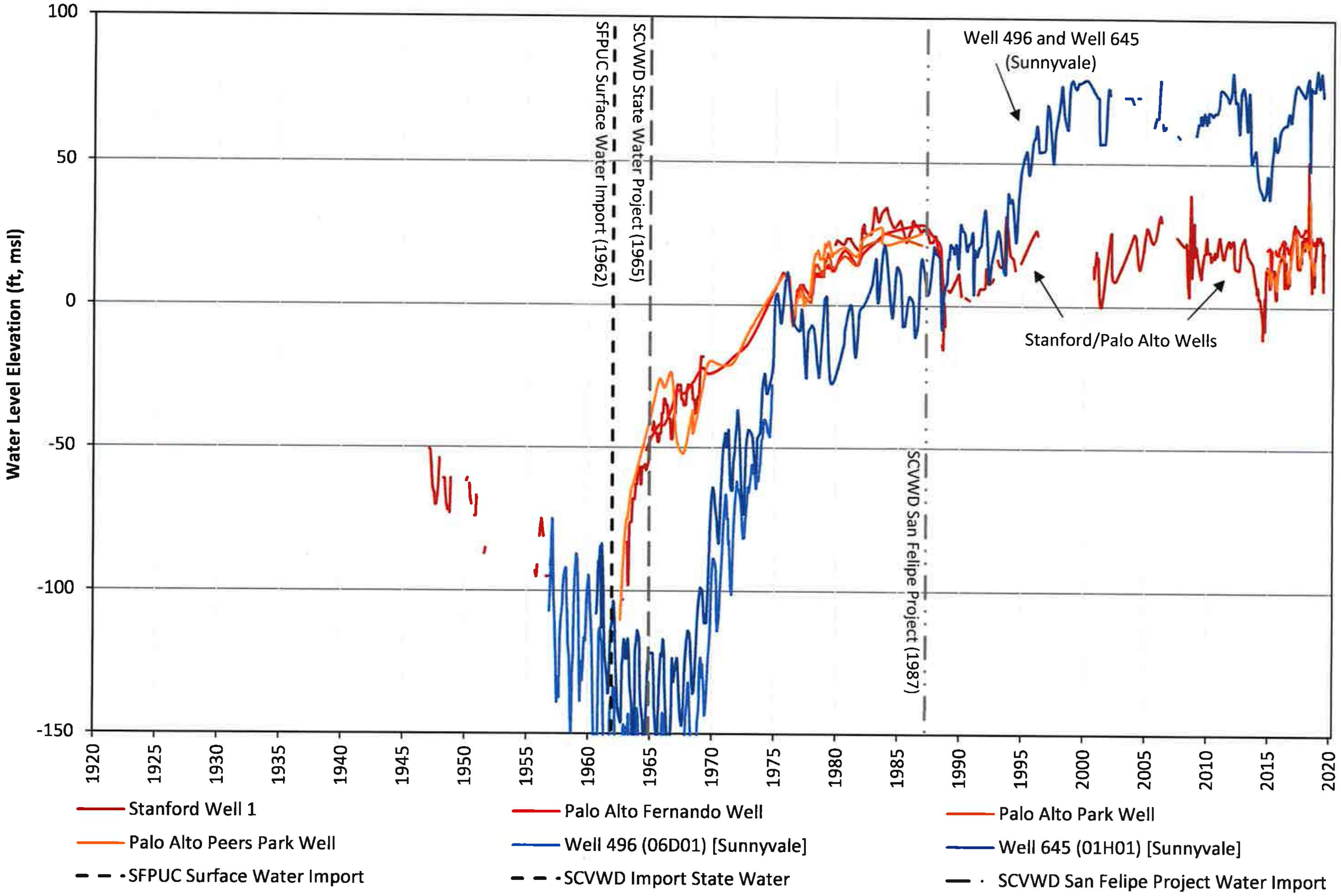
Tom W. Zigterman

Tom W. Zigterman, P.E., D.DRE
Director, Water Resources & Civil Infrastructure

c: Board@valleywater.org
ClerkoftheBoard@valleywater.org
nhawk@valleywater.org
ghall@valleywater.org
red@eslawfirm.com

WATER RESOURCES & CIVIL INFRASTRUCTURE GROUP
315 Bonair Siding, Stanford, CA 94305-7272 T 650-725-8081 F 650-723-3191

Attachment A: Impact of Imported Water Projects on Groundwater Levels



Valley Water Benefits Zone Study
Comments Summary and Proposal for Staff Report

Stanford, the City of Palo Alto, and Great Oaks Water Company appreciate the opportunities to comment on Valley Water's Benefits Zone Study and to participate in a meeting with staff on September 16, 2019. Our comments on the Study and a proposal for moving forward are summarized below:

Comments summary:

As pointed out in Stanford's review comments going back to May 2018, the Study's conclusion that the north county benefits from Valley Water's activities groundwater recharge activities is inadequately supported by either the concept of hydrogeologic connectivity, basin modeling, or historical groundwater level data evaluation. The Study took the approach that if a benefit was shown to have occurred at any time over the Study period, at any level, that the benefit is perpetual and never changes, even when there is an absence of data supporting the existence of the benefit.

The analysis examined specific multi-year time periods that appeared to Valley Water's consultants to show a possible benefit; however, upon review of the data of the periods identified, Stanford's consultants and Valley Water's consultants disagree about whether the Study's benefit conclusions are supported in the north county. One possible explanation for this difference in conclusion is that groundwater pumping by Palo Alto and Stanford was declining significantly with the introduction of SFPUC water to the region and groundwater was recovering substantially; the consultants differ in their opinions about the length, cause and extent of that recovery. Another consideration is that the consultant's Study scope was to analyze only Valley Water's activities with regard to groundwater recharge, and not others' activities that could explain groundwater level changes, such as changes in importation of surface water from outside the region (e.g., SFPUC water system) and the resulting in-lieu groundwater recharge, changes in local surface water diversion and use, and local direct recharge activities such as percolation of impounded storm water runoff. And still another consideration is that Valley Water policy dictates the use of taxing and pricing concepts that conflict with a reasonable allocation of costs for relative benefits received by those paying groundwater charges.

The working premise of the Study, as described by staff, is that only if NO benefit is concluded in the Study (primarily by review of geologic conditions) will such regions (and the wells therein) be removed from Valley Water's groundwater benefit Zones; there is no recognition of even a rough order-of-magnitude GRADATION of benefit. Therefore, if an outlying area distant from any recharge activities could POSSIBLY be receiving benefit of any amount or degree, then it was included in the Zone and pays full rate for groundwater pumping even if its benefit is negligible in comparison to those regions clearly receiving a greater level of that particular benefit.

This working premise directly conflicts with Valley Water policy. Valley Water Resolution 99-21, which is specifically considered by the Valley Water Board when setting groundwater charges, states, in pertinent part:

> Whenever costs associated with specific benefits are clearly and easily measurable, those costs shall be charged to the beneficiaries, in accordance with their specific zones of benefit. When there is a question as to the identity of the beneficiary or the method of measuring the benefit, the allocation of costs should remain flexible and be determined in accordance with accepted practices and sound judgements based on the four water pricing concepts.[1]

Hydrogeologic and technical analyses, including appropriate groundwater modeling, allows for easy measurement of specific benefits to specific groundwater pumping areas.[2] This fact was acknowledged during the course of the September 16 meeting, but it was also acknowledged that the Study did not and was not intended to measure benefits in this manner. It is our position that accepting the conclusions of the Study to establish the benefit zones generally identified in the Study will directly violate Valley Water policy referenced above.

Another factor, not discussed in much detail in the meeting or at all in the Study, is consideration of whether regions are within the service areas of Valley Water's treated water delivery systems; the cost of those systems is at least partially included in groundwater pumping fees. Regions that are outside of these systems' service areas pay groundwater rates that include the costs of these systems, even when no connection to these systems is available. So, the appropriate costs of treated water systems unavailable to groundwater pumpers that are passed along to those groundwater pumpers, if any, should also be examined in the Study and considered by the Board when making such determinations.

Proposal:

Stanford, Palo Alto, and Great Oaks request that Valley Water recognize that others' activities also benefit the basin and should be considered in setting the rates for groundwater pumping fees and charging pumpers. We propose that Valley Water take the time to evaluate comprehensively all the factors involved each claimed benefit as discussed above. This effort would include, at least, the following:

1. Recognize and identify regional rough-order-of-magnitude gradation of benefit (*e.g.*, negligible/unsubstantiated, feet, tens of feet, hundred-plus feet), and develop zones with a gradation of rates corresponding to the benefit levels. This analysis will take refined modeling and review of groundwater and other relevant water supply/use data, and, we believe, doable within a year. A process would be established to review and refine the boundaries of the zones upon request.

2. Recognize and develop a quantification mechanism for development and use of alternative water supplies (to groundwater pumping) such as imported water, use of local surface water, reuse of water (*e.g.*, recycled treated wastewater), and captured storm water, and implement a mechanism of offsets/credits to groundwater pumping fees recognizing these conditions/benefits to the basin.

---

[1] Resolution 99-21, at page 3 (Section entitled "Costs for Specific Benefits").

[2] The Study itself cannot be used to support any other conclusion, as measurement of specific benefits was neither within the scope of the Study nor attempted therein.

3. Recognize and develop a quantification mechanism for direct recharge activities, such as stormwater impoundments that percolate to unconfined zones, and implement a mechanism of offsets/credits to groundwater pumping fees recognizing these conditions/benefits to the basin.

4. Recognize the differences among water rights and uses (i.e., appropriative uses versus overlying uses).

5. Revise the groundwater pumping fee to exclude costs not associated with groundwater recharge, such as treated water systems, and pass the costs of those systems on to those getting that water only, as a fair cost of service approach.

We look forward to working with Valley Water on developing an appropriate and comprehensive approach to groundwater pumping fees recognizing all factors/activities and fairly assessing costs for benefits provided.

Groundwater Benefit Zone Study

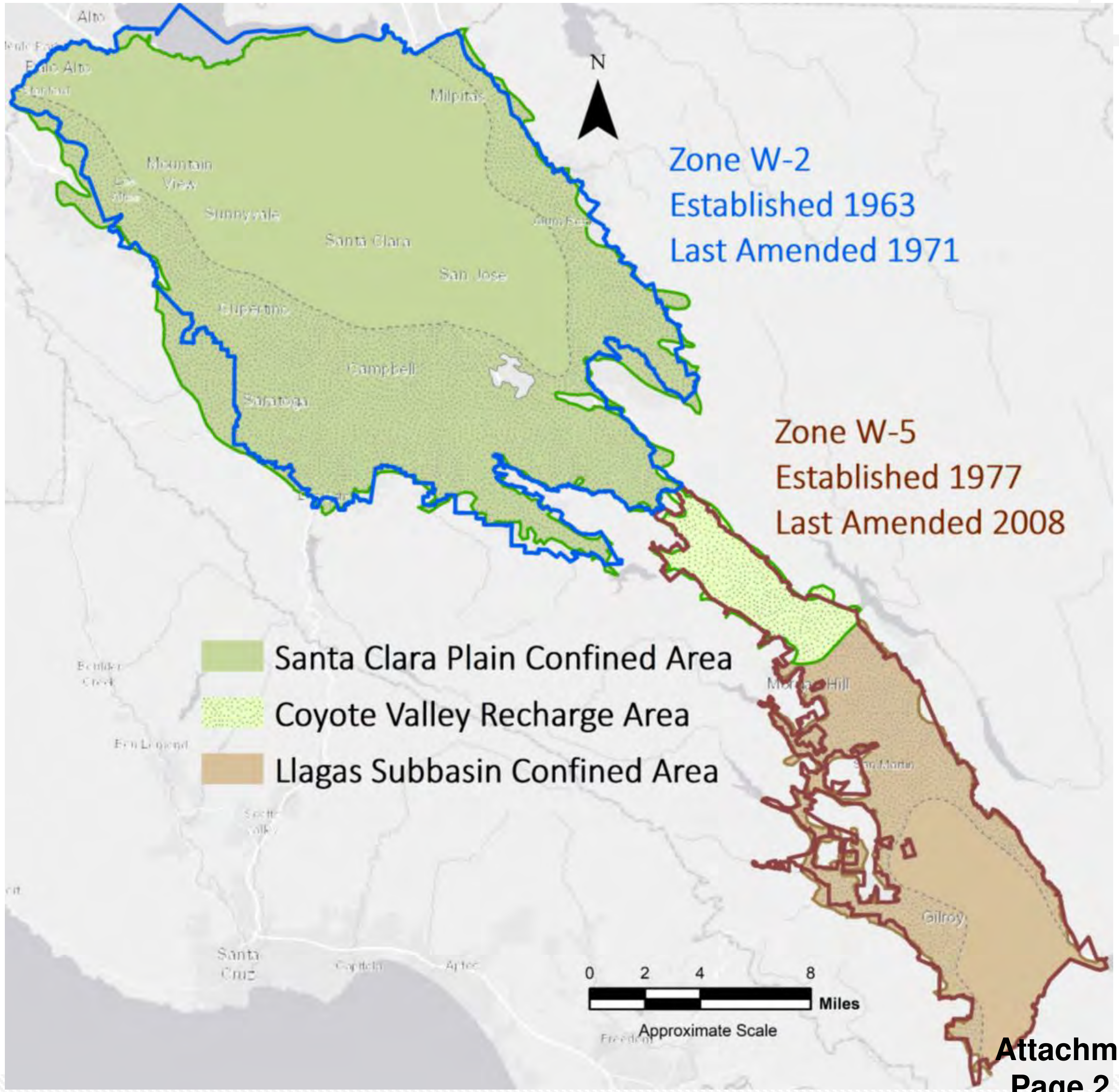
Board of Directors Consideration October 8, 2019

Valley Water

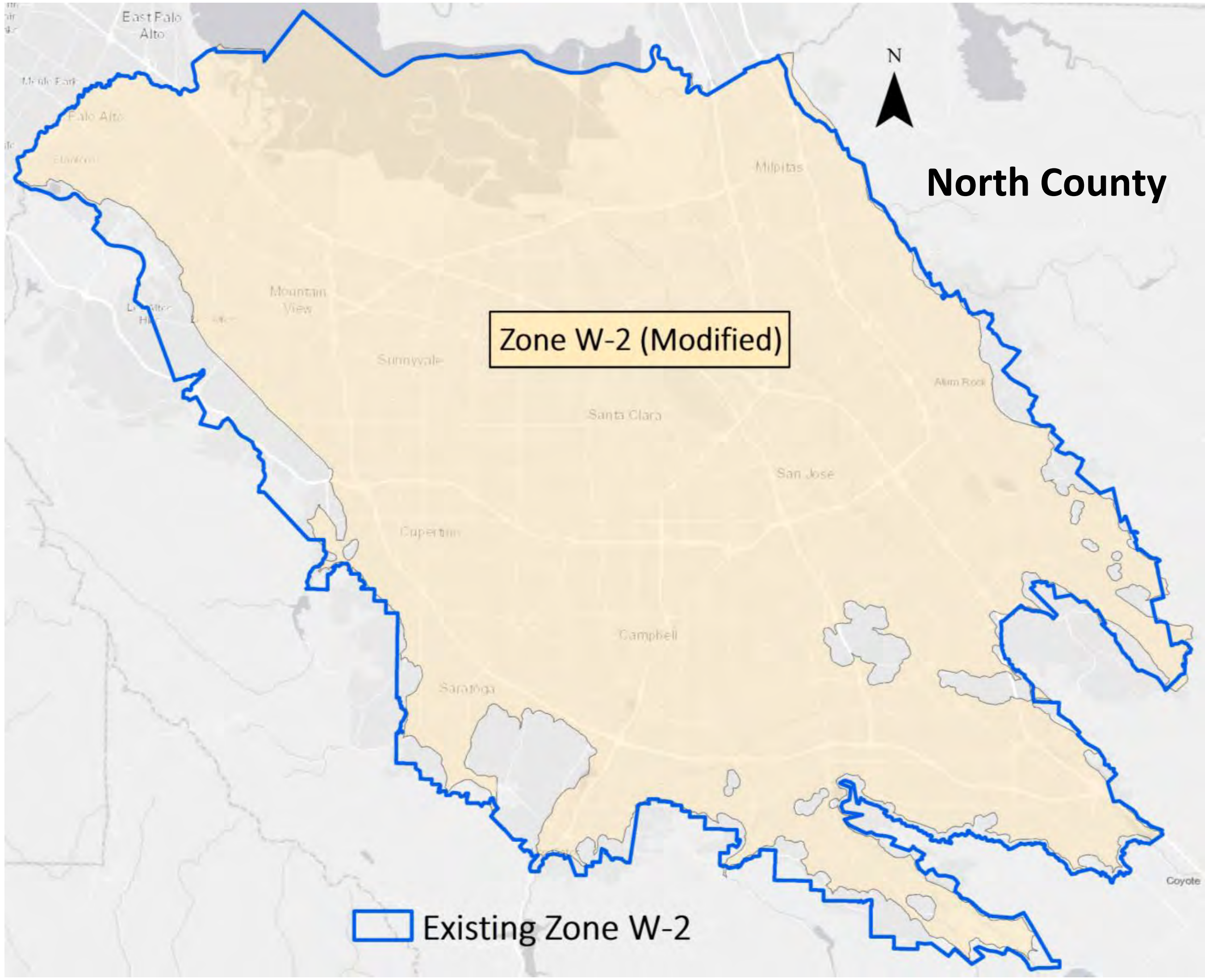
Recap: Groundwater Benefit Zone Study

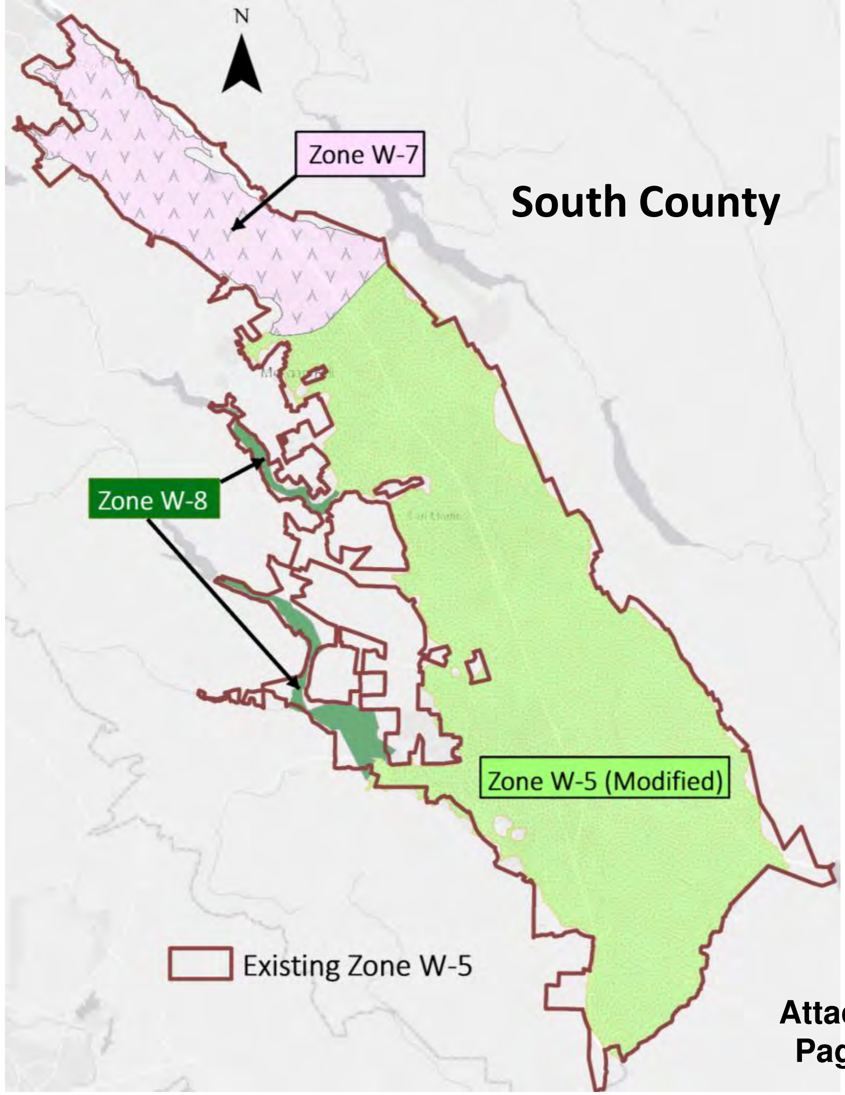
- Evaluate groundwater benefit zones (areas where charges are collected for groundwater pumped)

- Independent, science-based study to support fair and equitable charges for well users



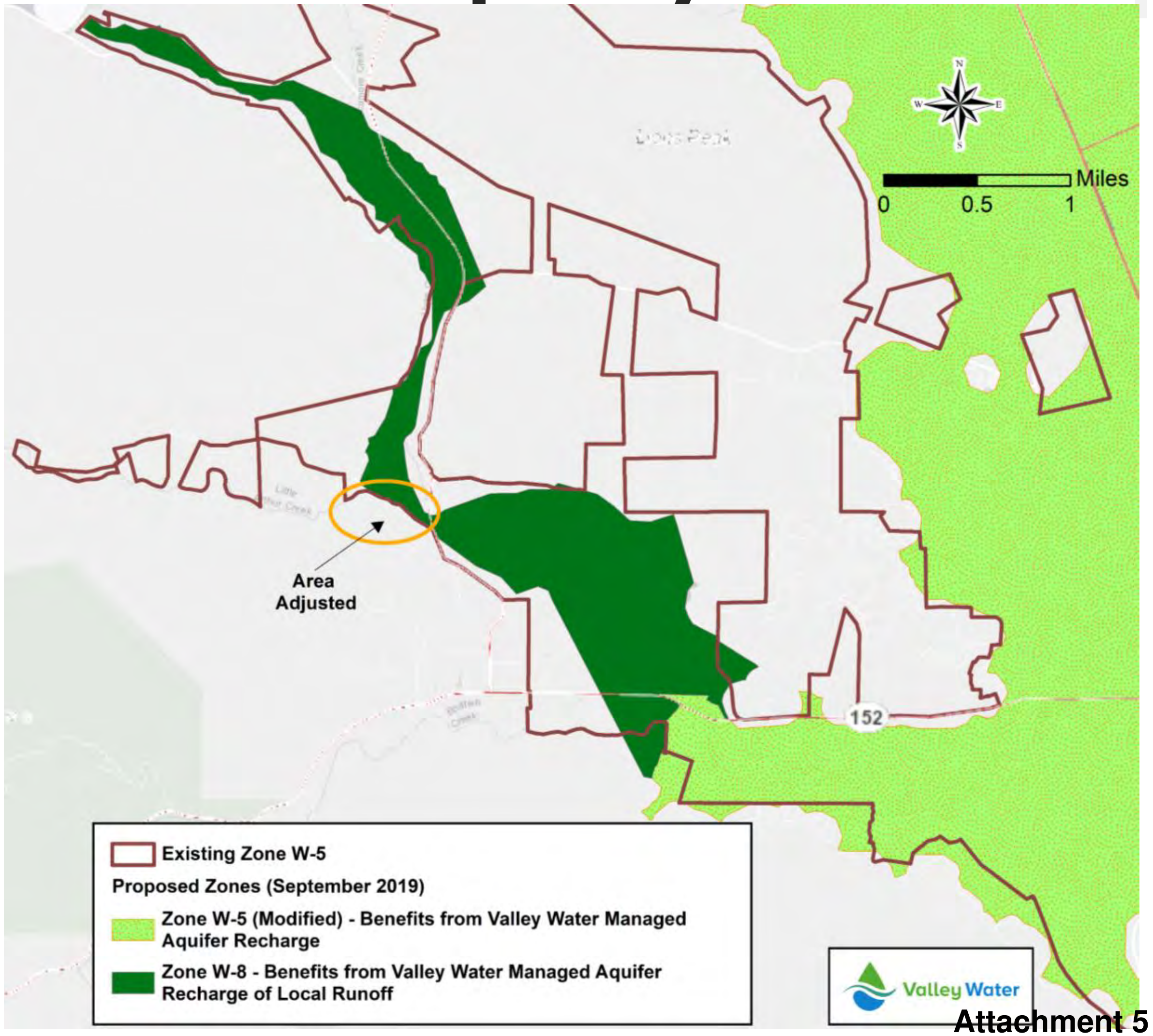
After extensive stakeholder engagement, staff recommendations for zone changes were presented to Board on August 27, 2019





Happy Acres Mutual Water Company comments

- Questioned inclusion in proposed Zone W-8 and provided local geologic data (well log)
- Well log demonstrates area overlies bedrock
- Proposed Zone W-8 adjusted to exclude this area
- Future individual exemption requests will be considered on a case-by-case basis and brought to the Board


N
W
E
S
Miles
0
0.5
1
Area Adjusted
152
▭ Existing Zone W-5
Proposed Zones (September 2019)
🟩 Zone W-5 (Modified) - Benefits from Valley Water Managed Aquifer Recharge
🟩 Zone W-8 - Benefits from Valley Water Managed Aquifer Recharge of Local Runoff
Valley Water

Staff met with Stanford, Palo Alto, and Great Oaks Water Company to further discuss their concerns

Concern discussed	Outcome of meeting
Benefits are not adequately demonstrated in their areas	• Valley Water staff believe the recommendation to continue to include areas in zone is well-supported and scientifically sound. • The three retailers do not agree.
San Francisco Public Utility Commission supplies and stormwater recharge are not adequately considered	• There was agreement the study was not intended to identify the benefit of non-Valley Water activities. • The three retailers suggested a credit system for actions by others to improve basin conditions as part of the rate-setting process.
Relative benefits of Valley Water activities were not considered (i.e., those further from activities pay less)	• The three retailers developed a proposal for a gradational approach to benefits, along with several policy recommendations (Attachment 3). • This would require more zones to facilitate the proposed structure, since charges within a zone must be uniform.

Retailer* proposal item 1 and staff evaluation

Summary: Identify regional “rough-order-of-magnitude” gradation of benefits and develop zones with a gradation of rates corresponding to benefit levels.

Staff evaluation:

- This would likely change every year based on water sources, pumping, and recharge, and would require ongoing, intensive technical and administrative effort.
- Using a regional flow model to quantify water level benefits goes beyond the model capability. Staff is doubtful that even a refined model could adequately quantify benefits from Valley Water activities in localized areas to the degree needed to support the imposition of different zones/charges.
- Thresholds used to separate gradational zones would be arbitrary and likely challenged by other well users.

* Stanford University, City of Palo Alto, and Great Oaks Water Company

Additional policy proposals raised by the three retailers --not directly related to the zone study

Retailer proposal item 2 and staff evaluation

Summary: Develop a mechanism to quantify and implement groundwater charge credits/offsets for actions by others to develop and use alternative water supplies to groundwater.

Staff evaluation:

- Each water provider makes decisions on its water supplies, including investments in alternative water supplies.
- Those using non-Valley Water supplies avoid or reduce groundwater pumping, and therefore avoid or reduce related costs.
- If a credit is pursued, challenging issues would need to be carefully evaluated, such as:
  - What alternative sources would be eligible? In areas with multiple sources, how can we identify those that offset groundwater versus another source?
  - How would eligibility criteria be identified and measured?
  - What factors would be used to determine the amount of credit and how would it be structured?
  - Who would pay for related credits and administrative costs?
- Since the cost of proposed credits may be borne by other water retailers and pumpers, staff recommends all retailers and pumpers be consulted if this proposal is pursued.
- If credits are made available, unintended consequences may occur, including over-investment by others in water supply projects, loss of control by Valley Water as a Groundwater Sustainability Agency in maintaining a desirable groundwater storage balance, and possibly inequitable rate burdens among rate payers.

Retailer proposal item 3 and staff evaluation

Summary: Develop a mechanism to quantify and implement groundwater charge credits/offsets for direct recharge activities.

Staff evaluation:

- Staff is not aware of any other entity in Santa Clara County conducting recharge for the purpose of augmenting groundwater supplies. However, incidental recharge occurs in many areas.
- Many entities infiltrate water to meet stormwater permitting, environmental, or mitigation requirements. Staff questions whether it is appropriate to provide a credit for an activity required for regulatory compliance.
- If credits are implemented, some entities may be motivated to develop projects where recharge benefits are negligible
- If a credit concept is pursued, careful consideration should be given to issues such as:
  - Is the infiltration intentional, needed, and located where it would augment groundwater supplies?
  - How would groundwater quality be protected?
  - Who would fund related credits, and how might they be structured?

Retailer proposal 4 and staff evaluation

Summary: Recognize the difference among water rights and uses (i.e., appropriative uses versus overlying uses).

Staff evaluation:

- Well users may have different water rights, including overlying and appropriative rights.
- Regardless of their water rights, any well user within a groundwater benefit zone is subject to groundwater charges.

Retailer proposal 5 and staff evaluation

Summary: Revise groundwater charges to exclude costs not associated with groundwater recharge, such as treated water deliveries, and pass those costs along only to systems receiving that water.

Staff evaluation:

- Treated water deliveries are associated with groundwater recharge, as they provide the same benefit and are essential to maintaining sustainable conditions in the northern Santa Clara Subbasin. The concept of in-lieu recharge (including delivery of treated water) is foundational in Valley Water's methodology for developing groundwater charges and supported by the District Act.

Do the proposals by the three retailers require changes to the zone study or staff recommendations?

- No, the study uses best available data and comprehensive analysis that supports the staff recommendation for four new or modified zones.

- The technical approach to evaluating the zones goes beyond what is done by other special act groundwater agencies and is scientifically sound.

- The proposals from Stanford, Palo Alto, and Great Oaks Water Company relate to policy perspectives, which the Board may want staff to explore in the future.

Staff recommendation (page 1 of 2)

- Move forward with four proposed zones based on best available data and comprehensive analysis

- Prepare legal survey description (metes and bounds) for Board consideration/adoption of:
  - Modified Zones W-2 and W-5
  - New Zones W-7 and W-8 (with minor adjustment to exclude Happy Acres Mutual Water Company)

Staff recommendation (page 2 of 2)

- Implement zone changes in FY 21 (effective July 1, 2020)
    - Conduct rate study for four recommended zones
    - Continue to collect water charges in existing zones until water rates for new/modified zones in effect
- Conduct future zone review if Valley Water activities change substantially, significant new hydrogeologic data are available, or more than 15 years has passed without review
- Take no action on proposal no. 1 (gradational groundwater benefit zones)
- Provide direction on the four policy issues raised by stakeholders.

Recommended schedule

August 27, 2019

- Board direction on new or modified zones

Fall 2019

- Prepare legal survey of zones
- Conduct rate study
- Set public hearing

(IF DIRECTED)

January 2020

- Public hearing to adopt new or modified zones

(IF DIRECTED)

July 2020

- New zones become effective July 1, 2020

(IF DIRECTED)

From:	George Cook <GCook@valleywater.org>
Sent:	Thursday, April 25, 2019 8:52 AM
To:	Arthur Keller
Subject:	RE: Groundwater Benefit Zone Study

Hi Mr. Keller,

Thank you for your comment on the Groundwater Benefit Zone Study. The study only evaluated the benefits from Valley Water activities funded by groundwater charges. The consultant performing the study found that all of Zone A (including areas receiving SFPUC deliveries) benefits from Valley Water's treated water deliveries, managed recharge, and other activities. While the location of these activities varies, the consultant determined that the benefits extend to hydrogeologically connected areas. SFPUC deliveries benefit local communities receiving the water as well as the region. However, consideration of benefits from non-Valley Water activities was not within the scope of the study. The study consultant will be present at the upcoming open houses, along with Valley Water staff. If you can attend one of the open houses, we would be happy to discuss this with you in more detail, or you can contact me directly at (408) 630-2964.

Thanks again.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

From: Arthur Keller <ptc@kellers.org>
Sent: Tuesday, April 23, 2019 9:47 PM
To: George Cook <GCook@valleywater.org>
Subject: Re: Groundwater Benefit Zone Study

Hi George, thanks for the notice of public meetings regarding the groundwater benefit zone study. I am wondering whether Zone A should be subdivided into the areas in northwest county receiving exclusively SFPUC water and no water from SCVWD and those areas receiving some or all water from SCVWD or the acquifer.

Page ES-7 states:

Zone A: Benefits from Managed Aquifer Recharge (Local and Imported Water), Treated Water Deliveries, and Recycled Water Deliveries in the Unconsolidated Alluvium of the Santa Clara

Plain. Zone A includes hydrogeologically connected areas of Unconsolidated Alluvium where benefits from both the District's treated water and managed aquifer recharge activities are demonstrated. This includes Unconsolidated Alluvium overlain by the specific District activities, and Unconsolidated Alluvium where groundwater level data and/or groundwater model results show benefits from both activities.

Those areas in northwest county receiving exclusively water derived from SFPUC ("SFPUC areas") obtain de minimus benefits from SCVWD Managed Aquifer Recharge as the nearest recharge facility in Cupertino likely provides minimal flow to SFPUC areas. Similarly SFPUC areas receive treated water from SFPUC, not SCVWD. There is a small amount of recycled water delivery in the SFPUC area, but that is minuscule in comparison to the total SFPUC water delivery to SFPUC areas. So subdividing Zone A into SFPUC areas and non-SFPUC areas appears warranted.

Best regards,
Arthur Keller

On Apr 23, 2019, at 5:17 PM, Valley Water <gcook@valleywater.org> wrote:

Maintaining sustainable groundwater is a key part of Valley Water's mission to provide safe, clean water to Silicon Valley for a healthy life, environment and economy. It is an essential local water resource and provides nearly half of the water used in the county. The areas benefiting from our activities are divided into different geographical zones. Different groundwater charges (rates charged for pumping groundwater) apply to each zone based on the set of activities that benefit each specific area.

From time to time, we review these zones to make sure they reflect current conditions. That's why a team of experts was hired to conduct a scientific study of the zones and their boundaries. Based on that study, we are proposing to make some changes to ensure groundwater users pay a fair, equitable rate based on the benefits received.

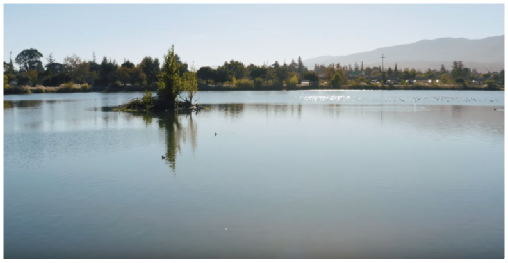
Visit our study website to learn more!

For more information, you can also contact Project Manager George Cook at (408) 630-2964 or gcook@valleywater.org.

Groundwater Benefit Zone Study Frequently Asked Questions

Questions about the study? Take a look at our **Frequently Asked Questions (FAQ)** to better understand the study and the proposed changes.

Read the FAQ



Groundwater, Valley Water Activities and the Study (video)

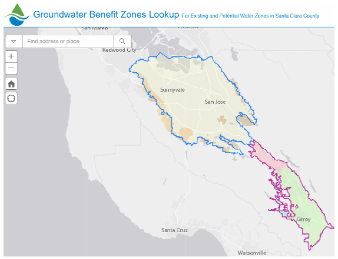
Watch this video to better understand groundwater, the activities to sustain it, and the Groundwater Benefit Zone Study.

Watch the Video

Learn more about the impacts to you (map app)

If you are a well owner or groundwater user, you can learn more about the potential impacts to you using our map-based online web application.

Search using your address, State well number or Assessor's Parcel Number.


Groundwater Benefit Zones Lookup
For Existing and Potential Water Zones in Santa Clara County
Find address or place
San Mateo
Redwood City
Sunnyvale
San Jose
Gilroy
Santa Cruz
Watsonville

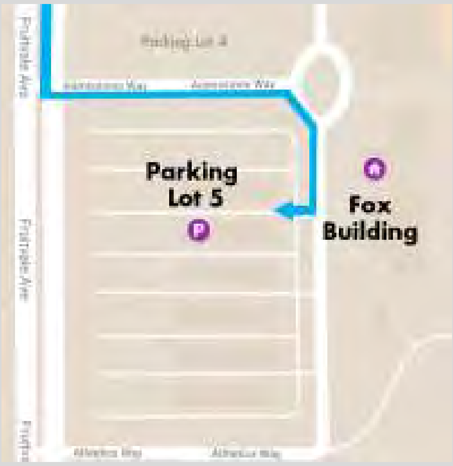
Attend an Open House

We understand this may impact you and other well owners. We invite you to attend one of the open houses we've scheduled, so we can explain how the proposed changes may affect you. Open house details and additional information sources are provided below.

RSVPs are highly encouraged: rsvp@valleywater.org

North County Open House

Tuesday, May 7, 2019
6:00 PM - 8:00 PM



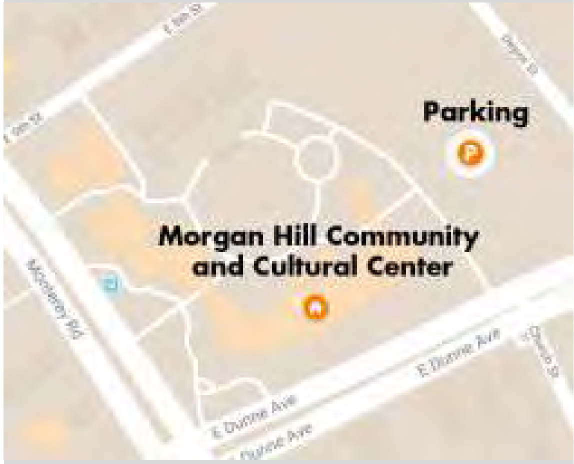
West Valley College
Fox Building (near Lot 5)
14000 Fruitvale Ave.
Saratoga, CA 95070

You can enter the following on your smartphone GPS app (Google Maps, Waze, Apple Maps): "**Parking Lot 5, Saratoga, CA**".

*Permits will be provided by staff when you enter Lot 5.

South County Open House

Tuesday, April 30, 2019
6:00 PM - 8:00 PM



Morgan Hill Community and Cultural Center
El Toro Room
17000 Monterey Rd.
Morgan Hill, CA 95037

Public parking is available in front of the center.

Valley Water
Clean Water • Healthy Environment • Flood Protection

http://www.valleywater.org/gwbenefits

From: George Cook <GCook@valleywater.org>
Sent: Friday, May 10, 2019 9:17 AM
To: Dailey, Karla
Cc: Bilir, Lisa
Subject: RE: Alta Mesa and the Zone of Benefit Study
Attachments: AltaMesa_Cemetery_Updated.pdf

Hi Karla,

I have attached a map with the proposed zones near Alta Mesa. If the proposed changes are adopted, the Alta Mesa cemetery wells would change from existing zone W2 to proposed zone B1. We estimate that the rates for proposed zone B1 would be about 30% lower than the existing zone W2 rate.

FYI – we have a map tool that allows users to enter an address, well number, or APN to see potential changes from the study at https://gis.valleywater.org/ZoB/

Please let me know if you have additional questions. Thanks

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

From: Dailey, Karla <Karla.Dailey@CityofPaloAlto.org>
Sent: Monday, May 06, 2019 12:41 PM
To: George Cook <GCook@valleywater.org>
Cc: Bilir, Lisa <Lisa.Bilir@CityofPaloAlto.org>
Subject: Alta Mesa and the Zone of Benefit Study

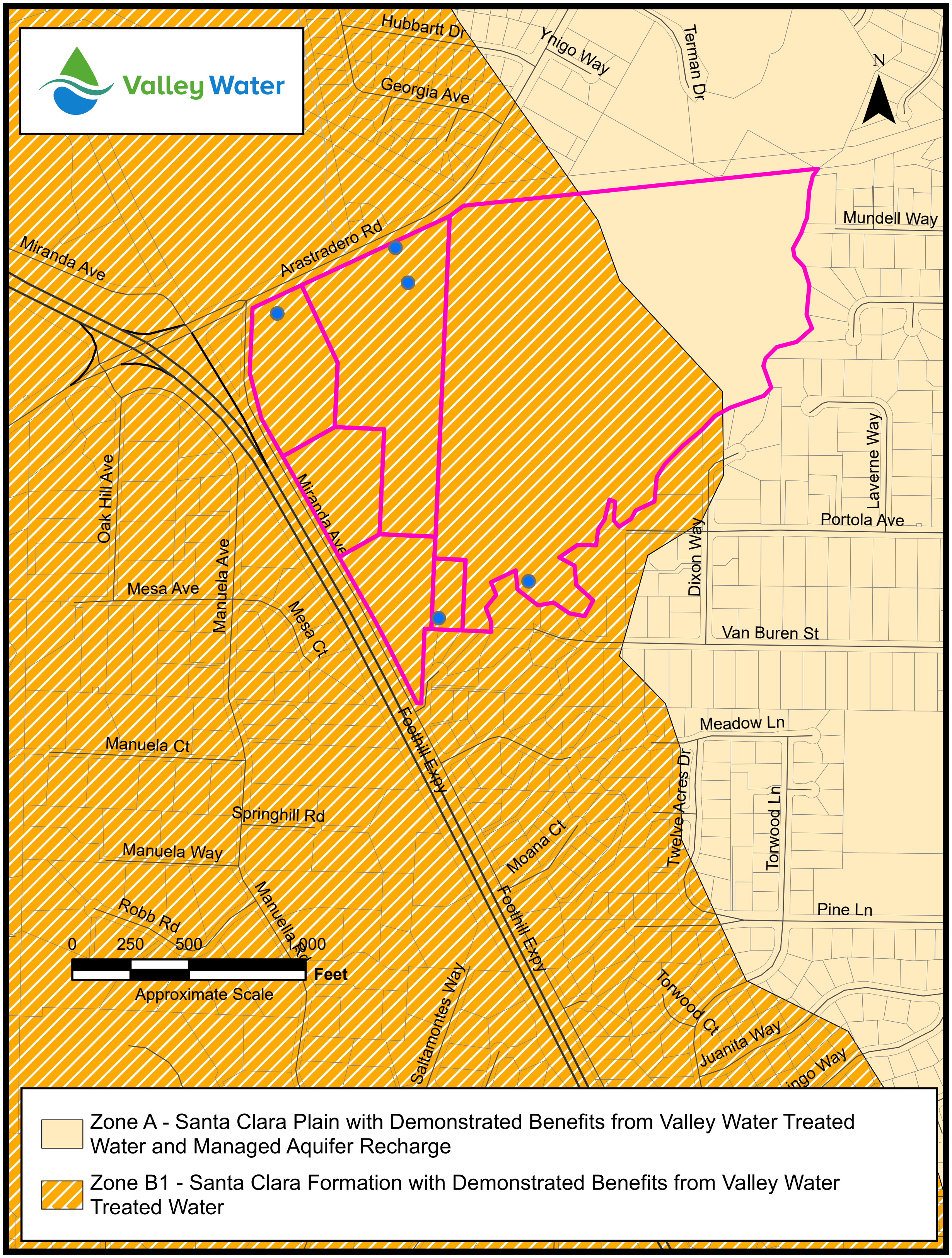
Hi George. Last we spoke it seemed the Alta Mesa cemetery wells are in a zone the might be recommended for reduced pumping rates. The scale on the map on the website is a little hard to see exact locations. Can you tell me what the latest proposal is for those wells used by Alta Mesa? Thanks.

www.valleywater.org/gwbenefits

Karla Dailey, Senior Resource Planner

City of Palo Alto Utilities
650-329-2523

Proposed Groundwater Benefit Zones
Alta Mesa Cemetery



▭ Zone A - Santa Clara Plain with Demonstrated Benefits from Valley Water Treated Water and Managed Aquifer Recharge

▨ Zone B1 - Santa Clara Formation with Demonstrated Benefits from Valley Water Treated Water

1. Based on zones proposed in Preliminary Zone of Benefit Study Report available at www.valleywater.org/gwbenefits
2. Boundary lines shown are approximate and subject to change. Any change to a groundwater benefit zone must be approved by the Valley Water Board of Directors.

DRAFT - Subject to Change May 2019

From:	George Cook <GCook@valleywater.org>
Sent:	Thursday, April 25, 2019 8:50 AM
To:	Kit Gordon
Subject:	RE: Adobe Creek

Hi Kit,

Thank you for your e-mail on the Groundwater Benefit Zone Study. I am going to answer your questions separately below:

Adobe Creek - The groundwater benefit zones are based on areas benefitting from our groundwater management activities. The consultants found that groundwater underlying the portion of the Adobe creek watershed within the proposed zones is benefitting from the delivery of Valley Water treated water (via Cal Water). The portion of the Adobe Creek watershed to the west of the proposed zones was not demonstrated to benefit from our groundwater management activities, therefore it cannot be included in a groundwater benefit zone.

Basements - The only local city that I know that has recently addressed basement dewatering is Palo Alto. They have an ordinance that regulates construction dewatering, including specific requirements for residential areas. A good summary of the ordinance and the last revisions can be found at https://www.cityofpaloalto.org/civicax/filebank/documents/62404 (staff report when the city council was considering revisions). A more detailed description of the construction dewatering requirements can be found at https://www.cityofpaloalto.org/civicax/filebank/documents/64867.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

-----Original Message-----
From: Kit Gordon <kitgordona@gmail.com>
Sent: Wednesday, April 24, 2019 6:46 AM
To: George Cook <GCook@valleywater.org>
Subject: Adobe Creek

Hi George,

I am a resident of Los Altos Hills and volunteer for Valley Water (IMC, One Water) and also volunteer for the Town of Los Altos Hills. I'd like to see more groundwater regulation in my town. Can you tell me why Adobe Creek and its tributaries are not in the groundwater benefit zones? Also, I’d like to change the Town’s regulation on basements in areas with high groundwater. There are several houses near Byrne Preserve (beyond the benefit zone) that pump groundwater from basements often year round. This water is dumped into Moody Creek (tributary of Adobe Creek). Do you know any cities that have changed basement construction methods to avoid groundwater pumping?

Thanks,
Kit

From: George Cook <GCook@valleywater.org>
Sent: Wednesday, May 15, 2019 2:49 PM
To: Amar Gupta
Subject: RE: Potential Well Water related changes
Attachments: Well_Log_07S02W22_0915124.pdf; Gupta.pdf

Mr. Gupta,

I am following up on your e-mail and our phone conversation regarding the groundwater benefit zone study and the potential impact of the proposed zones on your well. The attached map shows the location of your property and well compared to the existing and proposed groundwater benefit zones. As shown, your well is currently outside any zone, but is included in Proposed Zone B1. I will forward your well log (attached for your records) and your request below to our consultants that developed the proposed zones, for their consideration. If our Board of Directors adopts the proposed zones as they are currently delineated, you would be subject to the groundwater charge if you pump and use water from the well.

You stated that although the well was installed for potable use, you have not used it due to water quality concerns. Valley Water requires that wells not being used be properly destroyed by a licensed well driller. The reason for this requirement is that unused wells can pose a threat to water quality by providing a pathway for contaminants to enter groundwater, either from the ground surface or between underground water-bearing units connected by the well. Alternatively, if you believe you may use the well in the future, you can get a standby permit. Links to the standby permit application and permit fee schedule are below. For more information on well permitting, please contact our Well Ordinance Program Hotline at (408) 630-2660.

Standby Permit Application: https://www.valleywater.org/sites/default/files/2018-01/Standby%20Well%20Permit.pdf
Well Permit Fee Schedule:
https://www.valleywater.org/sites/default/files/Well%20Permit%20Fee%20Schedule.pdf

I hope this information helps you. If you have further questions please contact me at (408) 630-2964.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

From: Amar Gupta <amargupta2000@gmail.com>
Sent: Tuesday, May 07, 2019 3:50 PM
To: George Cook <GCook@valleywater.org>; Nai Hsueh <NHsueh@valleywater.org>
Subject: Potential Well Water related changes

Dear Mr. Cook,

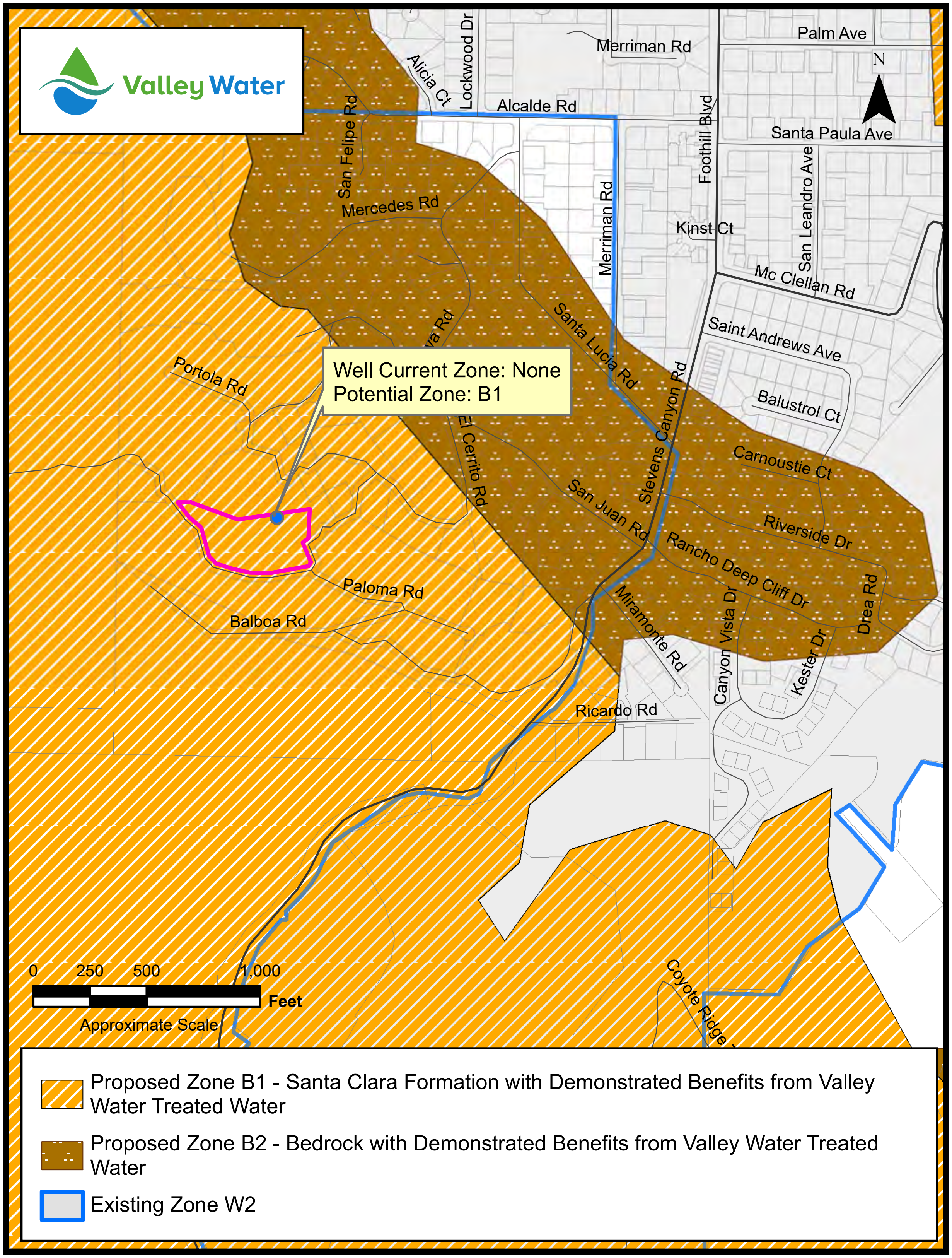
I have a well in my house that was originally planned for potable use. The water however had a very bad odor to it. Someone even commented that the water may even be contaminated from occasional septic tank seepage from neighboring areas. As a result, we decided NOT to use the well water and instead invest in pumping City water up about 400+ feet to our house. We have been pumping city water up through an intermediate Booster pump and paying for city water (San Jose Water) supply.

This is a single family dwelling and there is no farming activity. May I hence request that you exempt my well from the proposed ground water charge?

respectfully,

Amar Gupta
22975 Balboa Road
Cupertino, CA 95014
+1.408.718.1949

Proposed Groundwater Benefit Zones
22975 Balboa Rd



Well Current Zone: None
Potential Zone: B1

1. Based on zones proposed in Preliminary Zone of Benefit Study Report available at www.valleywater.org/gwbenefits
2. Boundary lines shown are approximate and subject to change. Any change to a groundwater benefit zone must be approved by the Valley Water Board of Directors.

DRAFT - Subject to Change

May 2019

ORIGINAL
File with DWR

Page 1 **of** 1
Owner's Well No. 1
Date Work Began 8/5/04, Ended 8/9/04
Local Permit Agency SCVWD
Permit No. 04W00334 Permit Date 4-21-04

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 0915124

DWR USE ONLY — DO NOT FILL IN

07S02W22E001
STATE WELL NO./STATION NO.

LATITUDE | LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Rotary-Air FLUID foam

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	10	Brown clay
10	40	Yellow clay
40	80	Brown clay
80	221	Gray claystone
221	450	Gray rock
450	540	Gray claystone
540	580	Gray rock
580	620	Gray claystone

*THE INFORMATION CONTAINED HEREON IS ACCURATE AS OF THE DATE BELOW AND IN NO A WARRANTY, EITHER IMPLIED OR EXPRESSED AS TO THE FUTURE CONDITIONS.

CONFIDENTIAL
FOR PUBLIC
WATER CODE SEC

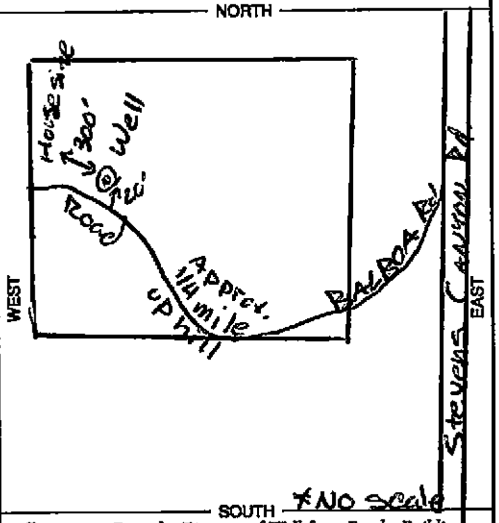
TOTAL DEPTH OF BORING 620 (Feet)
TOTAL DEPTH OF COMPLETED WELL 600 (Feet)

WELL OWNER

WELL LOCATION

Address Balboa Rd.
City Cupertino
County Santa Clara
APN Book 342 Page 31 Parcel 001
Township ___ Range ___ Section ___
Lat ___ N DEG. MIN. SEC. Long ___ W DEG. MIN. SEC.

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

USES (✓)

WATER SUPPLY
___ Domestic ___ Public
X Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 440 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 440 (Ft.) & DATE MEASURED 8/5&8/6/04
ESTIMATED YIELD * 15+ (GPM) & TEST TYPE airlift
TEST LENGTH 6 (Hrs.) TOTAL DRAWDOWN ---- (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	60	10"	x				PVCF480	5"	SDR21	
60	500	8½"	x				PVCF480	5"	SDR21	
500	600	8½"		x			PVCF480	5"	SDR21	.032"

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50		x		slurry
50	620			x	3/8"pea

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME GUARDINO WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 4825 Croy Rd. CITY Morgan Hill STATE CA ZIP 95037

Signed Hugo Guardino
C-57 LICENSED WATER WELL CONTRACTOR
DATE SIGNED 8/18/04
C-57 LICENSE NUMBER 664960

DWR 188 REV. 05-03

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

OSP 03 78836

Carol Meyer
26007 Torello Lane
Los Altos Hills, Ca 94022
June 27, 2019

George Cook
Valley Water District (via email)

Dear George,

This letter is in support of Staff recommendations in the forthcoming vote on new zones within the Valley Water District to not place Los Altos Hills well owners into Zones B-1 and B-2. This will mean that Los Altos Hills well owners will not be charged for water extraction. I understand the Board vote is to take place in August of this year.

As you know, I hired Langan Engineering and Environmental Services, Inc. to conduct an hydrogeological study to determine if the well owners in Los Altos Hills were receiving any benefit from Valley Water. Under separate email Langan has forwarded the study slides that were presented at a special meeting of well owners and representatives of Valley Water. The preliminary conclusion of this study was that Los Altos Hills well owners are in distinct geological formations not benefiting from California Water Company/Valley Water activities and, as such, should be excluded from water extraction charges. After the meeting, Langan requested well data from Valley Water for all wells in Los Altos Hills so that they could further confirm their preliminary findings by including all well data from Los Altos Hills.

I also filed a Freedom of Information Act request to get all well data for well owners in Los Altos Hills, which would give the Hydro-Geologists the data that they strongly suggest will confirm the preliminary results.

However, since Staff is recommending removal of Los Altos Hills from Zone B-1 and B-2 I would like to withdraw my Freedom of Information request for Los Altos Hills well owners at this time. I believe this withdrawal is in the best interests of Valley Water and myself to conserve time and effort. I do reserve the right to reinstate my request if the board does not adopt the staff recommendations.

I want to personally thank you and Gary Kreman for arranging the meeting we had with Dorinda Shipman from Langan, my attorney Greg O'Hara, many well owners in Los Altos Hills , and Valley Water Personal and Staff. I appreciated the attention given to Langan's presentation and conclusions and the effort to take the data into consideration in Staff's recommendations to the Board.

Very truly yours,

Carol Meyer

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

From: Steve Jordan [mailto:sjordan@ieee.org]
Sent: Monday, May 20, 2019 4:44 PM
To: Vanessa De La Piedra <vdelapiedra@valleywater.org>; Garth Hall <ghall@valleywater.org>
Cc: 'Gary Kremen' <gkremen@gmail.com>; 'Patrick Walter' <pwalter@purissimawater.org>; 'Joubin Pakpour' <JPakpour@pcgengr.com>; 'Phil Witt' <philw@purissimawater.org>
Subject: Groundwater in PHWD

Vanessa, Garth,

Thank you for the presentation on the groundwater study. I have attached the final report we received from Feeney in 2007. We were looking for supplemental sources at that time as we were 35% over our supply guarantee. You may get a lot more out of this than I do, but my conclusions from it are:

1. In our area ground water extractions were reduced substantially with the importation of water from SFPUC to Palo Alto beginning in 1961 and to Los Altos Hills beginning in 1957 through 1962. (PHWD annexed the small mutuals after building the initial system in 1957.)
2. There are no high production sites within PHWD, so we would have to construct a pipeline up to 2 miles to sites on the valley floor that could yield a 500 gpm well, vs. more like 50 gpm in the district.
3. This would suggest a fair price for groundwater in the district should be about 1/10th the price for the valley floor.
4. The Pulgas fault near Foothill Expy limits groundwater movement into PHWD territory.
5. The report suggests that Los Altos and Mountain View east of Foothill benefit dramatically more from groundwater Recharge.
6. It appears that Palo Alto and northern Los Altos Hills benefit from importation from the Hetch Hetchy system rather than importation from the SWP.
7. TDS and minerals content are high compared to Hetch Hetchy water so that TDS would double even at 5:1 blending. (SFPUC reports average TDS at 76 ppm).

You also asked for a few addresses of potential wells. We know of a few institutional customers contemplating wells:

Purissima Park 27554 Purissima Rd, Los Altos Hills, CA
These are the Little League baseball fields; the Town of LAH may want to drill a well. They would like to know what zone it is located in.

Public Works and Engineering - 27000 Purissima Road, Los Altos Hills, CA 94022 is adjacent to Purissima Park so an alternate location.

Fremont Hills Country Club 12889 Viscaino Place, Los Altos Hills, California 94022 formerly had a well along Purissima Road across from Purissima Park; they report SCVWD asked that it be taken out of service due to proximity to Deer Creek. You may have some historic production data on this well.

Thanks, Steve Jordan

From: Joe Callan [jcallan@saratogacc.com]
Sent: Monday, May 13, 2019 10:12 AM
To: George Cook
Subject: RE: Saratoga Country Club

Hi George,

I estimate that there will be between five and ten participants.

I was stunned when I received the District's communication about adding the Club to a zone that would be charged for water that is pumped from a well.
Part of the decision process in adding the wells was to check with the water district to determine, if we were in an area where pumping charges were applicable. Since we were not in such a zone, we funded the installation of the wells.

During the research and approval process, it was not communicated to the Club, that the zone boundaries were subject to change. Can we be omitted (grandfathered), based on this?

It would be difficult for the Club to argue the Science involved in the Districts research. However, at one point there was a determination to exclude our property from a zone that would be charged. Are the elements that went into that determination refuted? Does the District actually know the impact of our property on ground water? Or, is it just a theory? The District is using one firm for these determinations. Would the District consider funding a second opinion? I believe the properties above us were not added to a pay zone. If that is the case, why?

The water that we pump from our well is used exclusively for the golf
course. So, we a putting the water back into the ground. The quality of
water in our well is poor. To use it, we blend it with water purchased from the District. The ratio for the blend is 60% well and 40% purchased. So, we are recharging the aquifers with more than what we pump from our well.
What are your thoughts and was this considered?

We are current paying a substantial amount for water. With the ratio that we blend water in mind, the District's plan would more than double our cost.
In 2018 our water bill was approximately $118,000. We are a small Club.
The increase would have an adverse impact on our operation. What is the District's viewpoint on this?

This is all happening so fast. Even if we had been given a timely notice, the timeframe to respond is too short! I am assuming the District's research took a significant amount of time. For the Club, we are given less than ten days to respond. We have not been offered the research that has brought the District to its proposal. Can the deadline to respond be extended? Can the District's research be made available? Can the research with which the original boundaries were set be made available?

I appreciate your willingness to come to the Club on Tuesday and look
forward to meeting you. After entering the property proceed up the hill
until you reach a large parking lot. Turn right into the parking lot. Come into the lobby and I will be there to greet you.

Thank you,
Joe

-----Original Message-----

From: George Cook <GCook@valleywater.org>
Sent: Sunday, May 12, 2019 3:47 PM
To: Joe Callan <jcallan@saratogacc.com>
Subject: RE: Saratoga Country Club

Hi Joe.

I am available Tuesday evening. Please let me know how many of your Board members will be attending. Please let me know if you have any other questions. Thanks

George

From: Joe Callan [jcallan@saratogacc.com]
Sent: Saturday, May 11, 2019 2:05 PM
To: George Cook
Subject: Saratoga Country Club

Hi George,

When we spoke on the phone, you indicated that you would make yourself available to come to the Club to discuss the Districts plans to expand the zones in which properties with wells are charged for water. After surveying our Board, there are several members available on Tuesday evening. Are you available at 6:00 pm Tuesday evening?

Thank you,
Joe

Joe Callan
General Manager
Saratoga Country Club
(408)253-0340

From: George Cook <GCook@valleywater.org>
Sent: Friday, May 31, 2019 4:25 PM
To: Joe Callan
Subject: RE: Groundwater Benefit Zone Study

Hi Joe,

Thank you for the additional information, I will forward to our consultant for their review. Based on the pumping volumes you provided, the table below shows the estimated groundwater production charges the country club, located in proposed zone B1, would have paid. Please see the notes below the table.

Year[1]	Pumping (Gallons)	Pumping (Acre-Feet, AF)	Proposed Zone B1 Estimated Groundwater Charge ($ per acre-foot)[2]	Estimated Saratoga Country Club Groundwater Production Charge
2017	5,200,000	16.0	$745	$11,920
2018	3,900,000	12.0	$817	$9,804

1. Valley Water groundwater charges are based on the fiscal year (e.g., FY 17 is July 1, 2016 to June 30, 2017), so we assumed your pumping volumes were also based on the fiscal year.
2. Based on FY 18 data, the estimated rate for proposed zone B1 ($817/AF) is about 70% of the Board-adopted rate for existing zone W-2 ($1175). That same proportion was applied to the Board-adopted rate for FY 17 to estimate what the zone B1 FY 17 rate would have been. This allows you to see what the country club's charges would have been based on estimated rates and the volume pumped.

Valley Water has asked our consultant to review all information received from stakeholders, including you. We will check back in with you once all the information has been evaluated. This will occur as soon as possible to provide you adequate time to provide written comments to the Valley Water Board if you wish. The Valley Water Board will consider the technical recommendations from the consultant, recommendations from staff, and feedback from their constituents in making their decision on the zone boundaries.

With regard to potential water use efficiency improvements for your club, you should be receiving a call from Karen Koppett with our Water Supply Planning and Conservation Unit.

I hope this information helps. Please let me know if you have any further questions. Thanks.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

From: Joe Callan <jcallan@saratogacc.com>
Sent: Friday, May 24, 2019 4:14 PM
To: George Cook <GCook@valleywater.org>
Subject: RE: Groundwater Benefit Zone Study

Hi George,

Thank you for the well logs.

The attached file contains water tests for the well. Also attached is our pumping activity for 2018 and 2017.

Please get back to us with an estimate as to what the costs will be, if we are to be charged for our well water. Also, I would like to know your thoughts as to how the provided data might impact Valley Water's decision about our inclusion in the zone.

We plan to provide a letter with our view as to the change of zones once we get feedback from Valley Water on the data we are submitting and the potential annual cost to the Club.

Let me know, if you are looking for additional data from us.

Thank you,
Joe

Joe Callan
General Manager
Saratoga Country Club
(408)253-0340

From: George Cook <GCook@valleywater.org>
Sent: Monday, May 20, 2019 5:02 PM
To: jcallan@saratogacc.com
Cc: dmoffett@saratogacc.com
Subject: Groundwater Benefit Zone Study

Hi Joe,

Thank you for meeting with us last week. I was able to get your well logs (attached) from the DWR website. I have forwarded them to our consultant for their review and consideration. If you can get us your analytical results I will also forward them. Please let us know if you have any other questions or need anything else.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

Saratoga
Country Club

05/24/2019

Well Water Usage Report

24-May-19

Year	Gallons
2018	5,200,000
2017	3,900,000
Total:	9,100,000

6/14

New Well

Ana-Lync for Water

Info Sheet No: 252435
Sample Date: 6/3/2014
Lab Number: AL03068
Sample ID: NEW WELL
Region: 2
Zone: 3

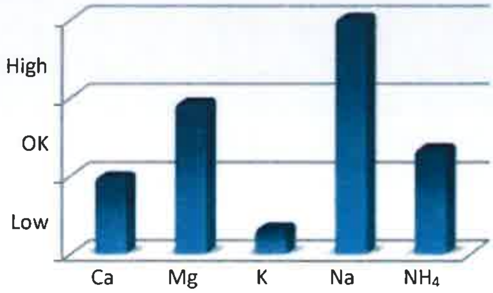
Distributor: Farmload Dist.-Thor Larson
Client: SARATOGA CC
SARATOGA, CA 95030

EC: 1.06
pH: 7.86
Hardness: 193.2

Water Charge Balance meq/L

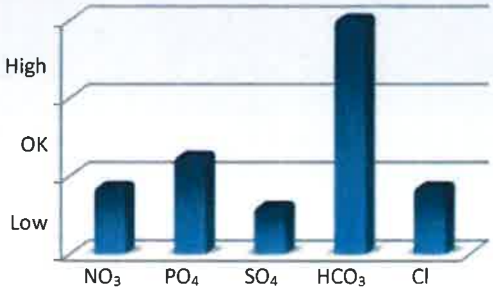
Ca	1.7	0.07	NO_3
Mg	2.2	0	PO_4
K	0.15	0.93	SO_4
Na	6.46	10.36	HCO_3
NH_4	0.39	0.96	Cl
Balance	**10.9**	**12.32**	**- 1.42**

CATIONS



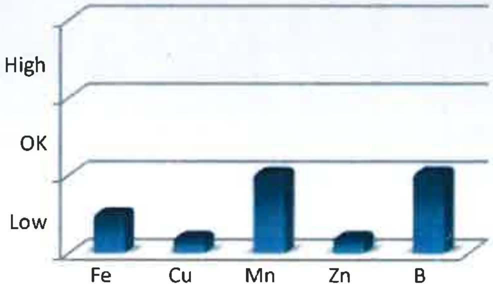
	Water ppm	Potential Soil Influence ppm	
Calcium	34.05	60.01	Low
Magnesium	26.36	25.54	OK
Potassium	5.74	37.27	Low
Sodium	148.49	92.29	High
Ammonium	7	23.77	OK

ANIONS



	Water ppm	Potential Soil Influence ppm	
Nitrate	1.02	14.29	Low
Phosphate	0.29	2.77	OK
Sulfate	44.65	17.72	Low
Bicarbonate	631.96	134.56	High
Chloride	33.87	56.04	Low

MICRONUTRIENTS



	Water ppm	Potential Soil Influence ppm	
Iron	0.05	0.05	Low
Copper	0.01	0.01	Low
Manganese	0.24	0.01	OK
Zinc	0.01	-	Low
Boron	0.25	0.48	OK

SUMMARY

New well 8/14

AgSource Laboratories
A Subsidiary of Cooperative Resources International

300 Speedway Circle, Suite 2
Lincoln, NE 68502

Tel: (402) 476-0300
Fax: (402) 476-0302

WATER ANALYSIS

Submitted For
SARATOGA CC

SAMPLE MARKED
NEW WELL

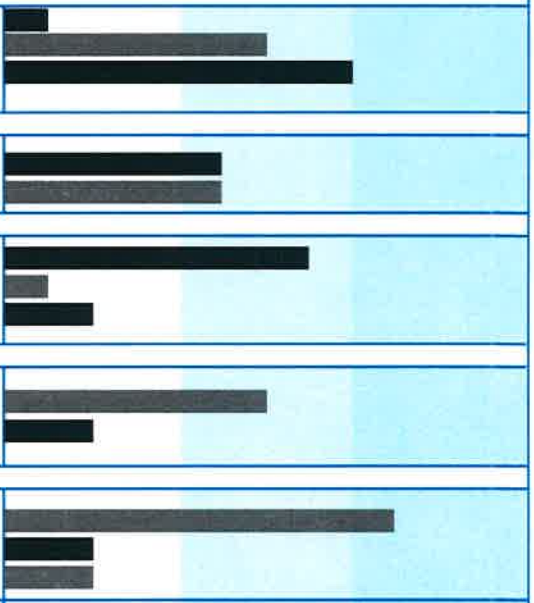
LABORATORY NUMBER
AL67410

Submitted By
Sustainable Turf Science/Utah
365 North 600 West
Logan, UT 84321

DATE RECEIVED
15-Aug-2014

DATE REPORTED
18-Aug-2014

ANALYSIS OF CHEMICAL PROPERTIES		UNIT OF MEASURE	RESULT	LBS/ ACRE FOOT
WATER CHARACTERISTICS	pH	-- --	7.32	-- --
	Hardness	-- --	184.42	-- --
	Bicarbonate	ppm	497.76	1353.91
	Carbonate	ppm	0.0	0.0
IMPACT ON GENERAL PLANT GROWTH	Electrical Conductivity (ECw)	mmhos/cm	0.90	-- --
	Total Soluble Salts	ppm	572.80	1558.02
IMPACT FROM ROOT CONTACT	Sodium	meq/l	6.06	-- --
	Chloride	ppm	26.17	71.18
	Boron	ppm	0.21	0.57
IMPACT FROM FOLIAGE CONTACT	Sodium	ppm	139.45	379.30
	Chloride	ppm	26.17	71.18
IMPACT ON SOIL STRUCTURE	Sodium Absorption Ratio Adj	meq/l	10.36	-- --
	Electrical Conductivity (ECw)	mmhos/cm	0.90	-- --
	Total Soluble Salts	ppm	572.80	1558.02



SATISFACTORY	POSSIBLE PROBLEM	PROBABLE PROBLEM
No anticipated difficulty with most crops.	Some difficulty for sensitive & moderately sensitive crops.	Significant difficulty for most crops.

To maintain good soil structure in arid regions, irrigation water should have the capacity to replace the soluble salts being dissolved. If the salts being dissolved are not replaced, a decrease in permeability may occur.

ANALYSIS OF NUTRIENTS

PLANT NUTRIENTS AS NORMALLY REPORTED IN WATER ANALYSIS	RESULTS AS PPM	NUTRIENTS CONVERTED TO BASIC FERTILIZER MATERIAL FORMS	RESULTS LB/ACRE FOOT
NITRATE (NO_3-N)	15.59	NITROGEN (N)	42.40
PHOSPHATE (PO_4)	0.47	PHOSPHATE (P_2O_5)	0.95
POTASSIUM (K)	3.66	POTASH (K_2O)	11.86
MAGNESIUM (Mg)	23.89	MAGNESIUM OXIDE (MgO)	107.50
CALCIUM (Ca)	34.59	CALCIUM (Ca)	94.08
SULFATE (SO_4)	33.13	SULFUR (S)	29.82
MANGANESE (Mn)	0.01	MANGANESE (Mn)	0.03
IRON (Fe)	0.05	IRON (Fe)	0.14
BORON (B)	0.21	BORON (B)	0.57

MEQ / LITER		
CATIONS	K^+	0.09
	Na^+	6.06
	Ca^{++}	1.73
	Mg^{++}	1.99
ANIONS	Cl^-	0.74
	SO_4^{--}	0.69
	HCO_3^-	8.16
	CO_3^{--}	0.0
	PO_4^{---}	0.01
	NO_3^-	1.11

pHc	7.07
Total Cations	9.87
Total Anions	10.71
SAR	4.44

Irrigation Water Contribution per Acre/Foot

SAMPLE : **Saratoga Country Club - New Well Irrigation Suitability - AgSource Lab Date: August 18, 2014**

pH: 7.32
ECw: 0.9
TDS: 576
Adj SAR 10.36

Constituent:	Bicarb	Chloride	Sodium	Nitrate	Phosphate	Potassium	Calcium	Magnesium	Sulfate	Boron
ppm:	497.76	26.17	139.45	15.59	0.47	3.66	34.59	23.89	33.13	0.21
X 2.72 =										
Pounds Per Acre-Foot	1353.9	71.2	379.3	42.4	1.3	10.0	94.1	65.0	90.1	0.6
lbs/applied per 1000sf	31.1	1.6	8.7	1.0	0.0	0.2	2.2	1.5	2.1	0.01

PPA of Ca - Mg - K to offset One Acre-Foot of Na in Irrigation Water with Pro-Active Amendment

The objective is to create a minimum 2.5 to 1 ratio of Calcium to Sodium while maintaining soil balance.

Ca:Na ratio 1.0 *Ca:Mg ratio* 4.5 *Ca:K ratio* 4.0

Amount needed to offset 1 acre-foot of water and maintain balance (black type)				*Annual and monthly amounts (brown type)*			lbs/1000	Combined Water and Amendments
Calcium	***285 PPA***	Multiplied		PPA Ca	856	converts to	19.6	26.12
Magnesium	***19 PPA***	by the total	→ 3.00 acre-feet/acre	PPA Mg	58	converts to	1.3	5.81
Potassium	***85 PPA***	water used		PPA K	255	converts to	5.8	6.53

How many amendment applications will be made per year? **9.0**

Calcium Required	***285 PPA***
Cal CM Gypsum / Ca = 23%	1240 PPA
Multiplied by total water used / Number of Apps	*5.5 lbs/1000/app*
Cal-Sul Gypsum / Ca = 21%	1358 PPA
Multiplied by total water used / Number of Apps	*10.4 lbs/1000/app*
Dolomite / Ca = 18.5% (Mg 9%)	1542 PPA
Multiplied by total water used / Number of Apps	*11.8 lbs/1000/app*
Calcium Nitrate / Ca = 19%	1501 PPA
Multiplied by total water used / Number of Apps	*11.5 lbs/1000/app*
Excellerator / Ca = 24%	1188 PPA
Multiplied by total water used / Number of Apps	*5.1 lbs/1000/app*
High Calcium Lime/ Ca = 38%	751 PPA
Multiplied by total water used / Number of Apps	*5.7 lbs/1000/app*

Magnesium Required	***19 PPA***
Dolomite / Mg = 9% (Ca 18.5%)	215 PPA
Multiplied by total water used / Number of Apps	*1.6 lbs/1000/app*
Granusol Mg Sucrate / Mg = 45%	43 PPA
Multiplied by total water used / Number of Apps	*0.3 lbs/1000/app*
K-Mag / Mg = 11% (18% K)	176 PPA
Multiplied by total water used / Number of Apps	*1.3 lbs/1000/app*
Pro Mag / Mg = 36%	54 PPA
Multiplied by total water used / Number of Apps	*0.4 lbs/1000/app*
Excellerator / Mg = 6%	322 PPA
Multiplied by total water used / Number of Apps	*2.5 lbs/1000/app*

Potassium Required	***85 PPA***
Potash 0-0-50 / Sol K = 42%	202 PPA
Multiplied by total water used / Number of Apps	*1.5 lbs/1000/app*
Pure K+ 0-0-27 /K = 22.4% (Ca 14%)	379 PPA
Multiplied by total water used / Number of Apps	*2.9 lbs/1000/app*
K-Mag / K = 18% (Mg 11%)	472 PPA
Multiplied by total water used / Number of Apps	*3.6 lbs/1000/app*
Mono-potassium-phosphate / K=34% (P=52%)	250 PPA
Multiplied by total water used / Number of Apps	*1.9 lbs/1000/app*
Potassium Nitrate / K = 46%	185 PPA
Multiplied by total water used / Number of Apps	*1.4 lbs/1000/app*
Best 10-4-16 / K = 13.3%	638 PPA
Multiplied by total water used / Number of Apps	*4.9 lbs/1000/app*

The amendments illustrated offer flexibility while adjusting content and availability to meet applicable targets and ratios. This will help offset irrigation water intrusion of sodium/salts, chloride and bicarbonate during high heat, low rainfall periods. Optimum turf health will be realized through monitoring and adjusting nutrient balance and availability (chemical) striving for an ideal microbial environment including the inoculation of beneficial colony forming units (biological), while promoting and maintaining proper soil structure (physical) to prevent sealing of soil optimizing water penetration and movement elevating oxygen availability and accommodating gas exchange.

Calculate primary and secondary constituents applied to realize any potential detriment based on time of year, weather/temps, application and reaction with other materials, burn potential, impact on soil, water quality issues - precipitation indicators, etc. If not familiar with an amendment request product analysis and application guidelines from your sales representative. You may also discuss preferred products, optimum rates, intervals and timing, application methods and impact on turf and/or soil.

The below calculation assists in providing a site specific analysis of annual irrigation water consumption.
This promotes a pro-active approach to maintain soil balance and offset detriments your water may impose.

If full heads are used, divide the number of heads per green by 2 and use that number to calculate how much is being applied to greens only

Average green has 0 heads that flow at 0 gpm for estimated 0 minutes/month
Times 0 greens. This equals - gallons x 0 months = - gallons.
Flushing for an estimated 0 min / month = - gallons x 0 months = - gallons.
When cool for an estimated 0 min / month = - gallons x 0 months = - gallons.
A combined total of - gallons s divided by 1 acres or 44 ,000 sq ft = - gallons/acre
This converts to - inches or 3.00 acre-feet of water applied per acre.

(1 acre-foot of water = 325,851 gallons / approx. 2,720,000 lbs.)

ststurf Irrigation Water Contribution per Acre/Foot

SAMPLE : **Saratoga Country Club - Jim Paresi - Well Water - AgSource Harris Lab Date: July 20, 2017**

pH: 8.13
ECw: 0.98
TDS: 627
Adj SAR 9.81

Constituent:	Bicarb	Chloride	Sodium	Nitrate	Phosphate	Potassium	Calcium	Magnesium	Sulfate	Boron
ppm:	555.83	30.30	136.49	2.68	0.52	5.67	40.60	27.09	37.91	0.22
X 2.72 =										
Pounds Per Acre-Foot	1511.9	82.4	371.3	7.3	1.4	15.4	110.4	73.7	103.1	0.6
lbs/applied per 1000sf	34.7	1.9	8.5	0.2	0.0	0.4	2.5	1.7	2.4	0.0

PPA of Ca - Mg - K to offset One Acre-Foot of Na in Irrigation Water with Pro-Active Amendment

The objective is to create a minimum 2.5 to 1 ratio of Calcium to Sodium while maintaining soil balance.

Ca:Na ratio **1.2** *Ca:Mg ratio* **6.0** *Ca:K ratio* **4.0**

Amount needed to offset 1 acre-foot of water and maintain balance (black type)					*Annual and monthly amounts (brown type)*			lbs/1000	Combined Water and Amendments
Calcium	***335***	***PPA***	Multiplied by the total water used →	2.50 acre-feet/acre	PPA Ca	838	converts to	19.2	25.57
Magnesium	***1***	***PPA***			PPA Mg	1	converts to	0.0	4.26
Potassium	***96***	***PPA***			PPA K	240	converts to	5.5	6.39

How many amendment applications will be made per year? ***8.0***

Calcium Required	***335***	***PPA***
Cal CM Gypsum / Ca = 23%	1457	PPA
Multiplied by total water used / Number of Apps	*10.5*	*lbs/1000/app*
Cal-Sul Gypsum / Ca = 21%	1596	PPA
Multiplied by total water used / Number of Apps	*11.4*	*lbs/1000/app*
Dolomite / Ca = 18.5% (Mg 9%)	1811	PPA
Multiplied by total water used / Number of Apps	*13.0*	*lbs/1000/app*
Calcium Nitrate / Ca = 19%	1764	PPA
Multiplied by total water used / Number of Apps	*12.7*	*lbs/1000/app*
Excellerator / Ca = 24%	1396	PPA
Multiplied by total water used / Number of Apps	*10.0*	*lbs/1000/app*
High Calcium Lime/ Ca = 38%	882	PPA
Multiplied by total water used / Number of Apps	*6.3*	*lbs/1000/app*

Magnesium Required	***1***	***PPA***
Dolomite / Mg = 9% (Ca 18.5%)	6	PPA
Multiplied by total water used / Number of Apps	*0.0*	*lbs/1000/app*
Granusol Mg Sucrate / Mg = 45%	1	PPA
Multiplied by total water used / Number of Apps	*0.0*	*lbs/1000/app*
K-Mag / Mg = 11% (18% K)	5	PPA
Multiplied by total water used / Number of Apps	*0.0*	*lbs/1000/app*
Pro Mag / Mg = 36%	2	PPA
Multiplied by total water used / Number of Apps	*0.0*	*lbs/1000/app*
Excellerator / Mg = 6%	9	PPA
Multiplied by total water used / Number of Apps	*0.1*	*lbs/1000/app*

Potassium Required	***96***	***PPA***
Potash 0-0-50 / Sol K = 42%	228	PPA
Multiplied by total water used / Number of Apps	*1.6*	*lbs/1000/app*
Green Science 0-0-30 /K = 25% (Ca 16%)	400	PPA
Multiplied by total water used / Number of Apps	*2.9*	*lbs/1000/app*
K-Mag / K = 18% (Mg 11%)	533	PPA
Multiplied by total water used / Number of Apps	*3.8*	*lbs/1000/app*
Mono-potassium-phosphate / K=34% (P=52%)	282	PPA
Multiplied by total water used / Number of Apps	*2.0*	*lbs/1000/app*
Potassium Nitrate / K = 46%	209	PPA
Multiplied by total water used / Number of Apps	*1.5*	*lbs/1000/app*
Green Spec 8-4-16 / K = 16%	600	PPA
Multiplied by total water used / Number of Apps	*4.3*	*lbs/1000/app*

The amendments illustrated offer flexibility while adjusting content and availability to meet applicable targets and ratios. This will help offset irrigation water intrusion of sodium/salts, chloride and bicarbonate during high heat, low rainfall periods. Optimum turf health will be realized through monitoring and adjusting nutrient balance and availability (chemical) striving for an ideal microbial environment including the inoculation of beneficial colony forming units (biological), while promoting and maintaining proper soil structure (physical) to prevent sealing of soil optimizing water penetration and movement elevating oxygen availability and accommodating gas exchange.

Calculate primary and secondary constituents applied to realize any potential detriment based on time of year, weather/temps, application and reaction with other materials, burn potential, impact on soil, water quality issues - precipitation indicators, etc. If not familiar with an amendment request product analysis and application guidelines from your sales representative. You may also discuss preferred products, optimum rates, intervals and timing, application methods and impact on turf and/or soil.

The below calculation assists in providing a site specific analysis of annual irrigation water consumption.
This promotes a pro-active approach to maintain soil balance and offset detriments your water may impose.

If full heads are used, divide the number of heads per green by 2 and use that number to calculate how much is being applied to greens only.

Average green has 0 heads that flow at 0 gpm for estimated 0 minutes/month
Times 0 greens. This equals - gallons x 0 months = - gallons.
Flushing for an estimated 0 min / month = - gallons x 0 months = - gallons.
When cool for an estimated 0 min / month = - gallons x 0 months = - gallons.
A combined total of - gallons is divided by 1 acres or 44 ,000 sq ft = - gallons/acre.
This converts to - inches or 2.50 acre-feet of water applied per acre.

(1 acre-foot of water = 325,851 gallons / approx. 2,720,000 lbs.)

Saratoga
Country Club

July 17, 2019

Santa Clara Valley Water District
Attn: George Cook
5750 Almaden Expressway
San Jose, CA 95118

Dear Mr. Cook,

I want to thank you and your colleagues for taking the time to meet with us at Saratoga Country Club to discuss the proposed changes to the Valley Water District's well zones.

On behalf of our Membership, the Board of Directors and Management of Saratoga Country Club strongly recommends that the proposed zoning changes be denied. Not only would an inclusion into the groundwater benefit zone certainly be punitive to our club, but it would also disincentivize the club to explore the possibility of a new well in future, forcing us to use 100% treated drinking water to irrigate our course.

We at Saratoga Country Club pride ourselves in seeking ways to conserve water while maintaining healthy turf. As an example, the Club spent more than $250,000 on a state-of-the-art irrigation system upgrade that can control every head separately. This avoids overwatering specific areas of the golf course. Also, our well water is only used for irrigation and does not go into the sewer. Any water not absorbed by the turf should theoretically help recharge the aquifer. We look forward to receiving recommendations from the SCVWD on other ways we could help conserve water.

Please keep us informed of any updates on this issue and also to the proposed date of the public hearing, as we would like to attend.

Respectfully,

Steven Gordon
President – Saratoga Country Club

21990 Prospect Road, Saratoga, CA 95070-6541 • 1 (408) 253-0340 • Fax 1 (408) 253-4056 • Website: www.saratogacc.com

Valley Water

Clean Water • Healthy Environment • Flood Protection

August 1, 2019

Mr. Steven Gordon
Saratoga Country Club
21990 Prospect Rd
Saratoga, CA 95070-6541

Subject**:** Response to Saratoga Country Club Comments on the Groundwater Benefit Zone Study Recommendations

Dear Mr. Gordon,

Thank you for your letter dated July 17, 2019 providing feedback on the groundwater benefit zone study. The Santa Clara Valley Water District (Valley Water) would like to provide an update on the study progress and recommendations. In the past few months, we have held three public open houses, answered numerous e-mail/phone inquiries, and met with well users including the Saratoga Country Club. Through this robust community outreach effort, Valley Water received valuable input and site-specific information from well users, which led staff to revisit the technical data and amend the recommendation for proposed zones.

The amended recommendation does not include the two new zones previously proposed along the western edge of the Santa Clara Valley. This is good news for the Saratoga Country Club as it means your groundwater wells are no longer recommended for inclusion in a groundwater benefit zone. If these recommendations are adopted by the Valley Water Board of Directors, the Saratoga Country Club would not pay for groundwater pumped from onsite wells.

Staff plans to present the amended recommendation to the Valley Water Board of Directors on August 27, 2019. More information is available at https://www.valleywater.org/how-we-operate/board-meetings-agendas-minutes. Also attached are updated frequently asked questions. Thank you again for your interest in the study, and for taking the time to meet with us and provide feedback. If you have any questions, please contact me at (408) 630-2964 or gcook@valleywater.org.

Sincerely,

George E Cook Jr

George Cook, P.G.
Senior Water Resources Specialist
Groundwater Management Unit

Attachment: Groundwater Benefit Zone Study Frequently Asked Questions (Updated June 2019)
ecc: Cameron Tana, Montgomery & Associates
G. Hall, V. De La Piedra

Groundwater Benefit Zone Study Frequently Asked Questions

1. What is a groundwater benefit zone?

Maintaining sustainable groundwater is a key part of Valley Water's mission to provide safe, clean water to Silicon Valley for a healthy life, environment and economy. A groundwater benefit zone is an area where our activities help protect and replenish groundwater supplies. Groundwater pumping charges collected in the groundwater benefit zones fund these activities. These charges are paid by owners and operators of groundwater wells (Well Users) based on the amount of water they pump. Valley Water charges only those Well Users in areas that benefit from Valley Water activities.

If you live within a groundwater benefit zone but do not pump groundwater, you do not have to pay the groundwater charge.

2. Why did Valley Water do this study?

The groundwater benefit zones were first developed in the 1960s and 1970s. Since that time, Valley Water activities to protect and replenish groundwater have changed. Knowledge about the zones that benefit from our activities has increased. To ensure Well Users are charged fairly and equitably, Valley Water hired a team of experts to conduct a science-based study of how to best define the groundwater benefit zones. The study is intended to provide Valley Water with a scientific, transparent basis for evaluating the current zones and proposing any changes. Total Valley Water revenue will not change as a result of any changes to the zones.

3. How was the study conducted?

The study was conducted by a consulting company specializing in developing, protecting, and managing groundwater and surface water resources. The study looked at how water flows underground using data from the U.S. Geological Survey and other agencies. Local data was also used to understand the effect of Valley Water activities on groundwater levels. The study was reviewed by an independent committee of technical experts, who found the study approach and results to be thorough and equitable. To learn more about the study, you can view the preliminary study report at: https://www.valleywater.org/gwbenefits.

The zones proposed in the preliminary study report were created by grouping areas that benefit from similar Valley Water activities, which include:

- replenishing groundwater with local and imported surface water,
- delivering surface water as an alternative supply in lieu of groundwater pumping,
- protecting groundwater from pollutants, and
- promoting water conservation.

4. Did the recommended zones change as a result of the stakeholder engagement process?

Yes. The consultant's preliminary study report recommended replacing the existing two zones with six zones. In addition to the consultant's technical study, Valley Water also sought and considered input and site-specific information from Well Users. Considering all available information, Valley Water staff now recommends a total of four zones. Staff believes there is ample evidence of benefit from Valley Water activities within these zones. Other areas may receive benefit from Valley Water activities; however, staff believes that additional geologic and groundwater data would be needed to fully justify adoption of groundwater charges for these other areas.

5. **How do I know if my well is recommended to be included in a groundwater benefit zone and what the potential impacts would be in my location?**

   Our Groundwater Benefit Zone Web App allows you to search your address, State Well number (e.g., 06S02W22G005), or Assessor's Parcel Number. This app provides information on existing and recommended zones, as well as preliminary rate estimates: https://gis.valleywater.org/ZoB/. In June 2019, this app was updated to reflect the zones recommended by Valley Water staff.

6. **When will the proposed zone changes take effect?**

   The proposed changes would only become effective if approved by Valley Water's Board of Directors. Staff plans to recommend changes to the Board in late summer of 2019. If changes are adopted, groundwater rates for the new zones would not be effective until July 2020 or later.

7. **I use a well for my water supply but am not currently in a groundwater benefit zone. If the proposed changes are approved and my well is added to a zone, how much will it cost me?**

   The cost to individual Well Users will vary depending on which zone they are in since each zone benefits from a different group of Valley Water activities. The cost will also depend on how much groundwater is pumped and the final rate adopted by the Valley Water Board of Directors. Average domestic groundwater use is 2,500 cubic feet per month, or 0.7 acre-feet per year. If you pump that amount, we estimate your groundwater charge assessed by Valley Water would be:

   - $76 per month if your well is in North County (north of the Coyote Valley).
   - $18 to $27 per month if your well is in South County (Coyote Valley south to Gilroy).

8. **If my well is already in a groundwater benefit zone, will my groundwater charges change?**

   If the recommended zone changes are approved, your groundwater charge would depend on location. Based on average domestic use (2,500 cubic feet/month), we estimate the charges would:

   - Increase or decrease by less than $2 per month for wells located in the valley floor, where nearly 90% of wells are located.
   - Decrease by $8 per month for wells located in the foothills of the Santa Cruz Mountains, above the flat valley floor.

9. **If Valley Water removes my well from a groundwater benefit zone, will I receive a refund? Why have I been paying if I receive no benefit?**

   The existing groundwater benefit zones (W-2 and W-5) were established based on the best available information in the 1960s and 1970s. Valley Water determined at that time that your area was benefitting from our activities. Our activities have changed over the last 40 years, and we know more about the groundwater basins. We now have decades of additional data to update the zones to ensure they fairly and equitably reflect benefits received.

   The charges collected relate to the groundwater benefit zones adopted by the Board and remain in effect until the Board adopts changes. Staff will recommend to the Board that Valley Water neither make refunds to those that are removed from a groundwater benefit zone, nor seek payment for past pumping from those that are added to a zone.

10. **Where can I find more information?**

    Please visit our study website at www.valleywater.org/gwbenefits. Project manager George Cook can also be reached via email at gcook@valleywater.org or by phone at (408) 630-2964.

From: Roy Woolsey <RoyWoolsey@sbcglobal.net>
Sent: Friday, August 03, 2018 2:45 PM
To: George Cook <GCook@valleywater.org>
Cc: Gary Kremen <GKremen@valleywater.org>; Stephen Jordan <sjordan@ieee.org>; Vanessa De La Piedra <vdelapiedra@valleywater.org>; Garth Hall <ghall@valleywater.org>; Nina Hawk <NHawk@valleywater.org>
Subject: Zone of Benefit Study

Hi George,

Thank you for your e-mail with information on the zone of benefit study status. I have thoroughly reviewed the "Draft Preliminary Zone of Benefit Study Report" and I find serious errors in the development of the proposed new Zone B1 which the report claims benefits from "in-lieu recharge."

The Santa Clara Valley Water District argues that Zone B1, which is in the Santa Clara Formation, benefits from delivery of district-treated water which reduces the demand for groundwater and therefore improves groundwater supply of the Santa Clara Formation. However, the northern portion of the proposed Zone B1 is served by the Purissima Hills Water District, which does not get any water from the SCVWD and therefore does not receive any treated water from the District. The PHWD boundaries are shown in the thin red line in the attached map. The thin green line shows the boundary of Los Altos Hills, so you can see that only a relatively small portion of Los Altos Hills is not served by PHWD.

The description of Zone B1 specifically mentions Cal Water Los Altos, which does receive treated water from SCVWD, but Cal Water is completely separate from the Purissima Hills Water District which does not get water from SCVWD. So Zone B1 needs to be modified to exclude its northern part that is served by the Purissima Hills Water District, per the red line on the attached map.

The arguments in the report also fail to note that groundwater levels in the Santa Clara Formation are typically significantly higher than groundwater levels in the valley alluvium, and ignore details of the nature of the Santa Clara Formation. In prior correspondence with SCVWD, I noted that the groundwater level at my well is 25 feet to 55 feet higher than the water level in the valley floor that is recharged by SCVWD operations. I further noted that the nature of the Santa Clara Formation is that it is composed of alternate alluvium and clay strata oriented roughly vertically, and that the clay strata act like a wall or dam to largely block water flow between the Santa Clara Formation and valley alluvium. Therefore, groundwater in the northern part of Los Altos Hills is higher than and largely separated from the groundwater in the valley alluvium, because of the clay strata.

In conclusion, the area including my well that is served by the Purissima Hills Water District should not be included in the Zone B1. Furthermore, this area does not receive any benefit from SCVWD groundwater recharge activities because of the higher groundwater levels in the Santa Clara Formation and the clay strata that act to retard groundwater flow and prevent recharge of the Santa Clara Formation by the valley alluvium in my area.

Yours very truly,
Roy Woolsey

On 7/25/2018 8:03 AM, George Cook wrote:

> Hi Dr. Woolsey,
>
> Thank you for your inquiry on the Zone of Benefit Study and the draft preliminary report. To provide transparency and opportunity for public input, we are planning extensive stakeholder outreach on the draft report. In addition to the Agricultural Water Advisory Committee meeting on April 2, we

presented to the Water Commission on March 28, 2018. Current outreach on the draft report is focused on large water retailers. However, because many individual well owners may be interested in this study, we will be holding various meetings to provide information and receive input. Once the schedule and format have been determined, we will notify you and other interested stakeholders. The draft study report and related recommendations will not be taken to the District Board of Directors for consideration until the stakeholder outreach is completed, and interested stakeholders will be notified of related Board meetings.

You are correct that the maps in the draft report are not detailed enough to determine how individual properties may be affected. We are developing an online mapping tool to allow users to see more detail on the draft zones; this tool will be linked on the study webpage to support outreach. The attached map shows your parcel and well, and the recommended changes to the zones of benefit in your area. Your property, currently in Zone W-2, would be located in Zone B-1 if the changes recommended by the consultant are adopted by the District Board. Based on the consultant's analysis, groundwater within Zone B-1 benefits from the delivery of District treated water; thus you would be subject to groundwater charges for any pumped groundwater due to this in-lieu recharge. The consultant's findings were that there is insufficient data to establish a benefit from the District's managed recharge programs in Zone B-1, so no related benefit was presumed. If Zone B-1 were adopted by the Board, groundwater production charges collected within the zone would not fund managed recharge activities.

It should be noted that the draft map attached is based on preliminary recommendations from the consultant, which have not been reviewed or considered by the Board. Due to the potential impacts of this study on individual well owners, District staff will actively seek and review technical input from external stakeholders, and will share that with the Board as they consider any potential zone changes.

All annual groundwater production statements were mailed out the first week of July. If you have not received yours yet, I recommend contacting our Water Revenue Unit at (408) 630-2770. Thank you again for your inquiry. If you have any further questions, please let me know.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Santa Clara Valley Water District
5750 Almaden Expy, San Jose, CA 95118
(408) 630-2964
gcook@valleywater.org

-----Original Message-----
From: Roy Woolsey <RoyWoolsey@sbcglobal.net>
Sent: Sunday, July 15, 2018 1:55 PM
To: George Cook <GCook@valleywater.org>
Cc: Gary Kremen <GKremen@valleywater.org>; Stephen Jordan <sjordan@ieee.org>
Subject: Zone of Benefit Study Status?

Hi George,

I have not heard from you since your e-mail below of almost a year ago. Meanwhile, I see that a "Preliminary Groundwater Zone Benefit Study" document has been posted on the SCVWD website.

Page 90 of this document contains a map of proposed zones of benefit. This map is not of high enough resolution that I can definitely determine where my well is in relation to these proposed zones. The explanation of the zones, including Zone A and Zone B1, does appear to recognize the arguments I have been making regarding the fact that wells in the vicinity of my well do not benefit from district recharge activities. Since I receive water from the Purissima Hills Water District, and not from Cal Water Los Altos, presumably any proposed in-lieu fees do NOT apply to me.

Page 94 of this document contains a somewhat higher-resolution map that appears to suggest that my well is not in either Zone A or Zone B1, which would be consistent with the arguments I have been making to the District for years.

What is the status of this proposed plan? While the Zone of Benefit Study was discussed with the Agricultural Water Advisory Committee on April 2, 2018, I have not seen any agenda item that it has been considered or approved by the SCVWD Board of Directors. Yet I have NOT received any annual water production statement for the fiscal year just ended, so I wonder if the District finally recognizes my arguments and is not including me in the current assessment zone or assessing me any groundwater extraction charges?

Thanks for your clarification of this matter.

Yours very truly,
Roy Woolsey

On 7/17/2017 10:49 AM, George Cook wrote:

> Hi Roy,
>
> I hope you are having a good summer. The consultant has completed their evaluation and is preparing the Draft Preliminary Study Report, which will undergo review by a Technical Review Committee comprised of external groundwater and water policy experts. We expect to take the Preliminary Study Report to the Board of Directors as an informational item this fall. After this Board meeting, staff plans to hold stakeholder meetings to give interested parties an opportunity to provide feedback. Staff will then take the Study Report (including related recommendations and a summary of stakeholder input), to the Board for direction.
>
> We will notify everyone who has expressed interest in the Zone of Benefit Study (including you) once the Preliminary Study Report is on the Board agenda. The Preliminary Study Report will also be available on the webpage at that time. Thank you for your continued interest in the Study.
>
> GEORGE COOK
> ASSOCIATE ENGINEERING GEOLOGIST
> Groundwater Management Unit
> Santa Clara Valley Water District
> 5750 Almaden Expy, San Jose, CA 95118
> (408) 630-2964
> gcook@valleywater.org
>
> -----Original Message-----

From: Roy Woolsey [mailto:Roy@WoolseyMail.com]
Sent: Friday, July 14, 2017 11:32 AM
To: George Cook <GCook@valleywater.org>
Cc: Gary Kremen <GKremen@valleywater.org>; Stephen Jordan <sjordan@ieee.org>; Gary Waldeck <gcwaldeck@gmail.com>
Subject: Zone of Benefit Study Status?

Hi George,

It has been a long time since I have been in touch with you. I do NOT see any recent update about the District's zone of benefit study on the District's website, and I wonder where that study stands?

In particular, I wonder if the District has realized the my understanding of the local geology and hydrology in northern Los Altos Hills is correct, and the District knows it really does not have the authority to assess me for groundwater production charges, and therefore is not making progress towards correcting the zone boundaries in order to leave the existing boundaries in place?

Presumably you saw the attached legal brief I prepared early this year.
Pages 5, 6 and 7 of this brief provide discussion of very important information from the State of California Department of Water Resources Bulletin 118-1, Appendix A -- "the "bible" of the local geology and hydrology that provides clear proof of the arguments I have been making to the Santa Clara Valley Water District, that my well does not receive benefit from District operations so my well should not be part of the assessment zone.

I look forward to receiving information from you on the current status of the zone of benefit study.

Best regards, Roy Woolsey

Supplemental No. 2
AGENDA ITEM #2.E
Distributed 4/17/19

Roy B. Woolsey
Los Altos Hills, CA 94022

17 April 2019

Mayor and Members of the City Council
Town of Los Altos Hills
26379 Fremont Road
Los Altos Hills, CA 94022

Dear Mayor and Members of the City Council:

The purpose of this letter is to alert you to some issues regarding the 4/18/19 Santa Clara Valley Water District presentation to Council, and questions you should ask during the presentation. The "bottom line" is that SCVWD has no basis for any groundwater production charges to well owners in LAH.

By way of background: The Santa Clara Valley Water District Act by the California Legislature gives SCVWD the authority to collect groundwater charges for the production of water from areas which benefit from SCVWD groundwater recharge activities. Groundwater levels in Los Altos Hills are 40 to 50 feet higher than the groundwater levels elsewhere in Santa Clara County that are recharged by SCVWD, so our wells do not benefit from this recharge activity. This is because strata in LAH includes layers of vertically-oriented clay strata that act like a wall or dam to largely block water flow between LAH and the valley, and LAH aquifers are recharged naturally from the hills to the southwest of us. After years of my arguing this point with SCVWD, the District apparently admits this is the case by stating on its 6th slide, "Well users would no longer fund recharge on valley floor."

So instead of arguing that our wells benefit from any recharge activity, SCVWD argues (5th slide) that it delivers treated water to our area through the water sold to Cal Water and that this reduces groundwater demand from geologic formations in LAH and therefore improves groundwater supply – an argument which makes no sense and sounds like just trying to find any excuse to charge us, given that most of LAH gets its water from Hetch Hetchy through the Purissima Hills Water District and any improvement in groundwater levels from PHWD water is not due to SCVWD.

I and several other well owners in LAH are working with a professional geologist to firm up these arguments to prove that SCVWD has no basis for any groundwater charge to our wells. So here are questions for you as Councilmembers to ask during the presentation regarding the benefits to LAH:

1. How can SCVWD argue that the delivery of water treated by SCVWD reduces demand for groundwater and therefore improve groundwater levels, when most of water used by LAH residents is provided by Purissima Hills Water District, which gets 100% of its water from Hetch Hetchy?

2. Given this error relating to SCVWD-treated water deliveries through Cal Water, how can SCVWD justify any charges to LAH well owners, given the provisions of the SCVWD Act that only give SCVWD authority to collect groundwater production charges from well owners that benefit from its activities?

3. Don't most benefits to LAH listed on the 5th slide apply to all residents of LAH, and not just to well owners? Do the very few benefits that do (well permitting, water quality testing) justify only a 30% reduction in charges noted on the last slide, rather than a 95% or 100% reduction in charges?

Yours very truly,

Roy B. Woolsey

From: Vince Zunino <vince@zunino.net>
Sent: Friday, May 24, 2019 10:56 AM
To: George Cook <GCook@valleywater.org>
Subject: Fw: New Proposed Groundwater Benefit Zone in Los Altos Hills

Hi George,

It was nice meeting you at the Los Altos Hills meeting of well owners on Wednesday June 22. Many of the concerns about the validity of the Valley Groundwater Benefit Zone Study proposed zone B1 that were brought to your attention at this meeting mirror my own. Specifically, the implausible assumption made by the study that the Santa Clara Formation is hydrogeologically connected throughout Los Altos Hills. No attempt was made by the district in this study to validate this dubious assumption through the study of actual well data or any other means. The study fall far short of demonstrating any benefit of district activities to well owners in Los Altos Hills who are outside of district surface water delivery areas.

As I mentioned in the email below, I have well data for my well that could shed some light on whether your proposed zone B1 boundary in my neighborhood is accurate. I believe that my well data shows conclusively that my well does not benefit from Valley Water activities. I am asking that my well data be examined by your team and my well excluded from your proposed zone B1.

Would you please provide me your mailing address?

Thanks for your assistance,

vince zunino

----- Forwarded Message -----
From: Vince Zunino <vince@zunino.net>
To: George Cook <gcook@valleywater.org>
Cc: Diane Downend <diane@edenbridgehomes.com>
Sent: Monday, April 29, 2019 8:05 AM
Subject: New Proposed Groundwater Benefit Zones in Los Altos Hills

Hi George,

I recently became aware of the Valley Water Groundwater Benefit Zone Study and have just reviewed the Groundwater Benefit Zone Map Web App on the Valley Water website.

The Web App shows a new proposed zone (B1) meanders through my neighborhood and loops around my property but my neighbors just a few doors West of my property are all excluded from the proposed benefit zone. This raises an obvious question as to how the boundary of this proposed benefit zone was determined as my property sits on the same geologic formation as all of my surrounding neighbors. Any well placed on neighboring properties to mine would obviously tap into the same aquifer as my well.

I would like to understand the scientific basis of how the exact boundary of this benefit zone was determined and how my property benefits from Valley Water treated water deliveries in the Santa Clara Formation but the properties of my immediate neighbors do not.

In way of background my neighborhood is supplied water by Purissima Hills from a large tank set on the top of a hill that my property sits along the flank of. This water tank is tied directly to the Hetchy Hetchy system. To my knowledge Valley Water treated water deliveries have never been made in my neighborhood.

I have a considerable amount of specific knowledge of the details of the well bore and on my property and an analysis of the well water that may be pertinent to your study and the setting of the benefit zone boundary in my neighborhood. Was data from well bores near the assumed boundary of this benefit zone used to validate the accuracy of the proposed boundary? No one from your team has contacted me during the course of this study.

Is there someone knowledgeable about this issue on your team that I can meet with and discuss my concerns and input in more detail? I believe the boundary of the proposed benefit zone in my neighborhood is most likely inaccurate based on my well bore hole details and other actual field information that I possess.

Thank you for your attention to this matter.

Sincerely,

Vince Zunino

26555 Ascension Dr.
Los Altos Hills

650 948-7932

~~ORIGINAL~~
~~File with DWR~~

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

Page ___ of ___
Owner's Well No. 1
Date Work Began 8-5-94 Ended 8-22-94
Local Permit Agency SCVWD
Permit No. 94W0985 Permit Date 8-2-94

No. 578185

DWR USE ONLY — DO NOT FILL IN
06S03W25GBR
STATE WELL NO./STATION NO.
LATITUDE ___ LONGITUDE ___
APN/TRS/OTHER ___

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	3	Surface Soil
3	11	Light Brown Clay
11	86	Hard Brown Clay + Gravel
86	250	Lite Grey Wacke

TOTAL DEPTH OF BORING 250 (Feet)
TOTAL DEPTH OF COMPLETED WELL 236 (Feet)

WELL OWNER

[redacted]

WELL LOCATION

Address 26555 Ascension Dr.
City Los Altos Hills
County Santa Clara
APN Book 175 Page 53 Parcel 27
or
Township ___ Range ___ Section ___
or
Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH

NORTH
See Attached
WEST EAST
SOUTH
Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (*Describe Procedures and Materials Under "GEOLOGIC LOG"*)

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
___ Domestic
___ Public
✓ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Rotary FLUID Air

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 68 (Ft.) & DATE MEASURED ___
ESTIMATED YIELD* 7 (GPM) & TEST TYPE Pump
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 150 (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	156	10	✓				PVC 480	5	SDR21	
156	236	10		✓			" "	"	"	0.032

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	✓			
50	236				Pea Gravel

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME ASE Drilling, Inc.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

468 Franklin Ln Livermore CA 94550
ADDRESS CITY STATE ZIP

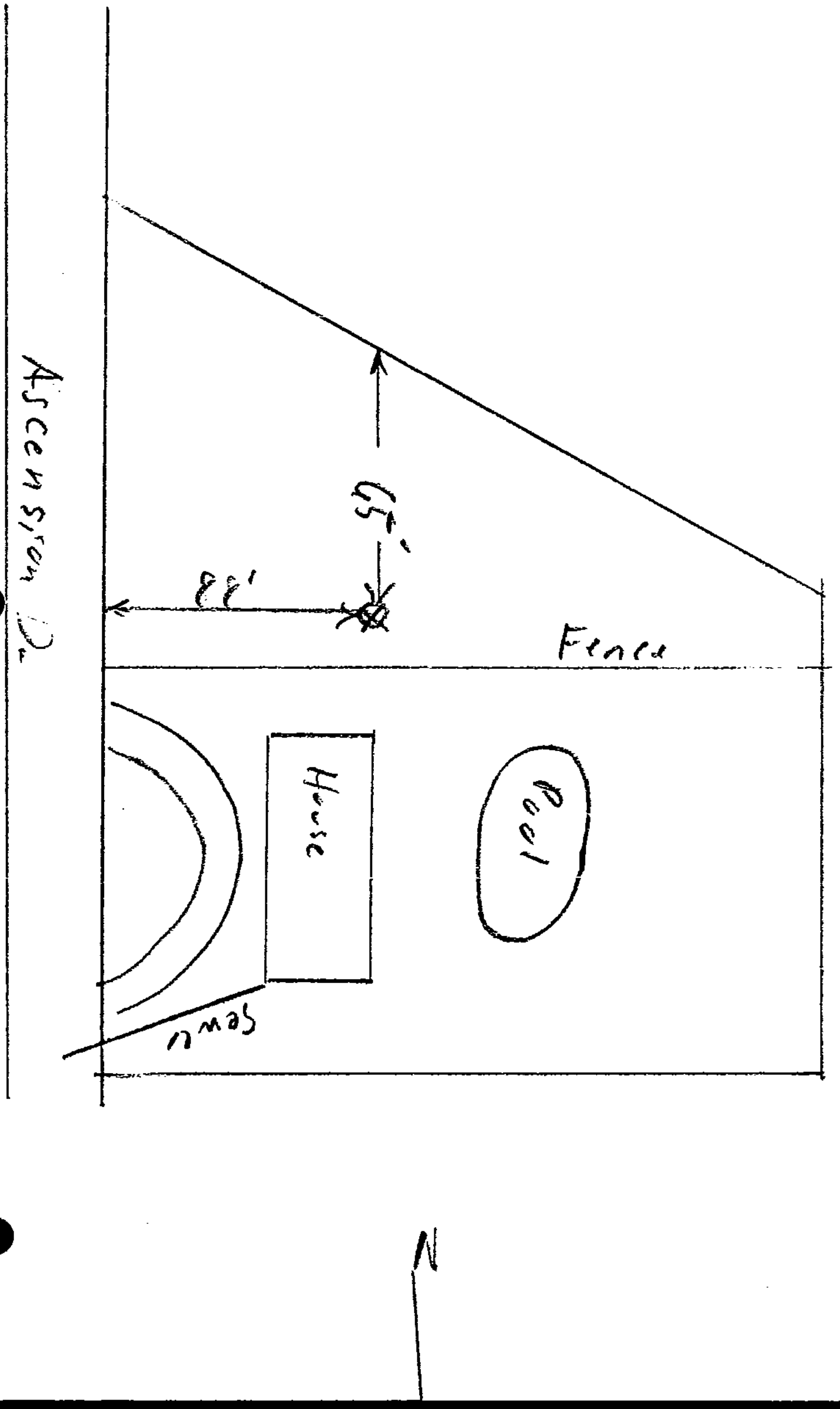
Signed W E Rush
WELL DRILLER/AUTHORIZED REPRESENTATIVE
9/5/94 DATE SIGNED
629340 C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

1783

578185



From: George Cook <GCook@valleywater.org>
Sent: Friday, May 10, 2019 8:16 AM
To: cliffbaumann@yahoo.com
Subject: Groundwater Benefit Zone Study
Attachments: Baumann.pdf

Hi Cliff,

We are following up on our conversation at the open house the other night. We did locate the letter you referred to about not being subject to the groundwater charges. It looks like at that time Valley Water discovered that your well was outside the existing charge zone and corrected the situation by ending any billing and refunding several years of charges paid. We apologize for any confusion we may have caused at the meeting, but we were unaware of this correction. The attached map shows your parcel, well, and the existing and proposed zone in your area. If the proposed zones are adopted, you would be in zone B2 and be subject to groundwater charges for any groundwater pumped.

The benefit to proposed zone B2 is from the distribution of Valley Water treated water. From our discussion you noted that you and your neighbors are not connected to the San Jose Water Co. system. We have contacted San Jose Water Company and are looking into this, and will be relaying related information to our consultant that developed the proposed zones. If this results in changes to the proposed zone in your area, we will let you know. Please let us know if you have any further questions.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

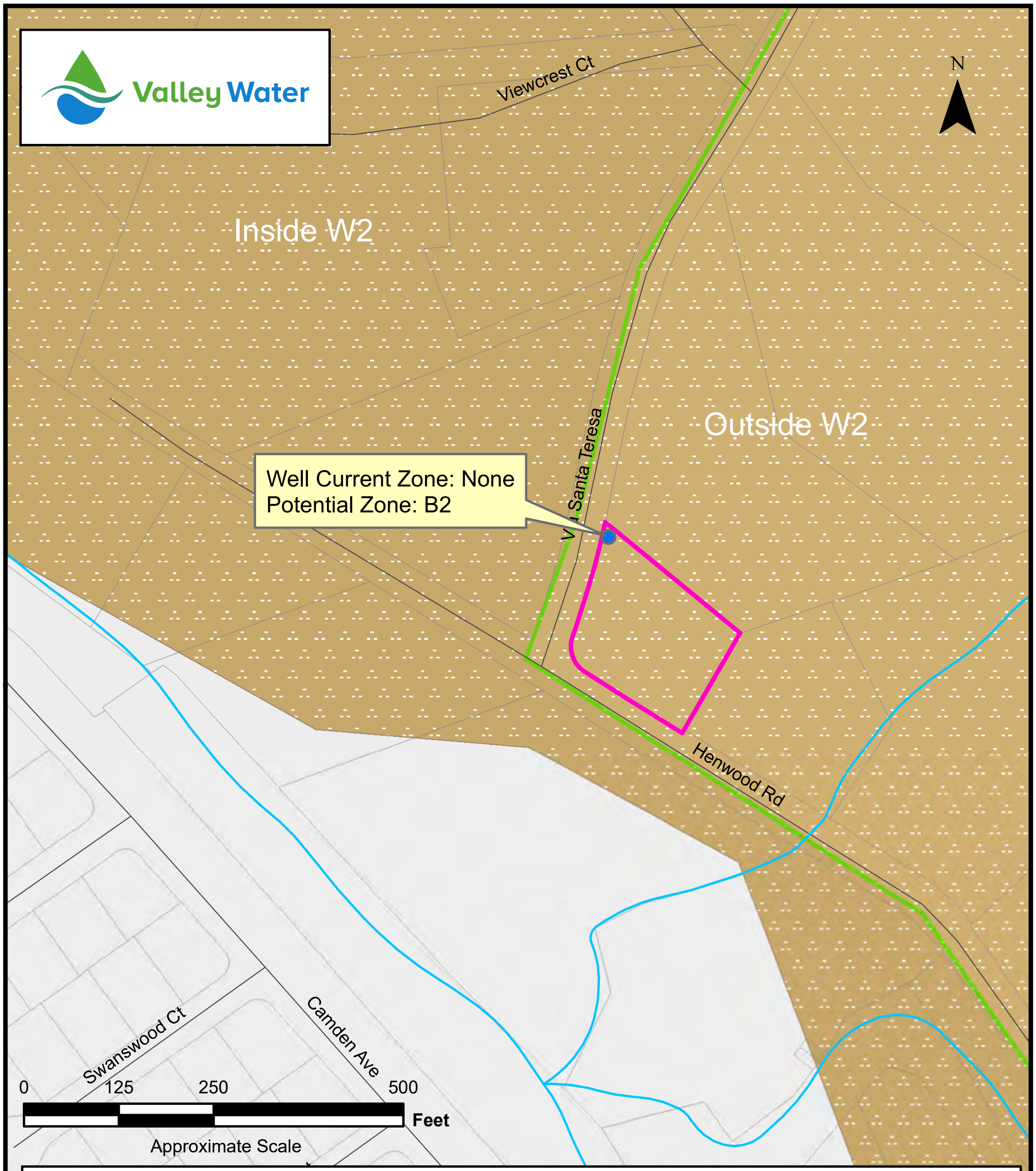
Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

Proposed Groundwater Benefit Zones
20601 Henwood Rd, San Jose



- Creeks
- ▨ Proposed Zone B2 - Bedrock with Demonstrated Benefits from Valley Water Treated Water
- 🟩 Existing Zone W2

1. Based on zones proposed in Preliminary Zone of Benefit Study Report available at www.valleywater.org/gwbenefits
2. Boundary lines shown are approximate and subject to change. Any change to a groundwater benefit zone must be approved by the Valley Water Board of Directors.

DRAFT - Subject to Change May 2019

From: George Cook
Sent: Thursday, April 25, 2019 2:14 PM
To: Gilbert Meyer <gilbertmmeyer@yahoo.com>
Subject: Groundwater Benefit Zone Study

Hi Mr. Meyer,

It was nice talking to you. I have attached the May 28, 2013 Agenda packet for your request, it includes information you had sent to us and our evaluation and recommendation to the Board. I have also attached the meeting minutes, which includes the Board's decision on your request. I hope this helps.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

From: George Cook
Sent: Thursday, May 09, 2019 10:39 AM
To: Phil Gregory <pgregory@nktechnologies.com>
Cc: Bassam Kassab <BKassab@valleywater.org>
Subject: RE: Groundwater Benefit Zone Study

Hi Phil,

It was nice talking to you last night. I have attached a map of your parcel, wells, and the existing and proposed zones. Also attached per your request is the map showing Valley Water's water supply distribution infrastructure. You had also asked for information on the Uvas-Llagas Transfer Pipeline. This pipeline allows Valley Water to move water from the Uvas Reservoir (which is fed by runoff from the productive Uvas Watershed) to Llagas Creek. Llagas Creek is downstream of the Chesbro Reservoir, which does not typically fill as quickly as the Uvas Reservoir. The pipeline provides us with operational flexibility that helps us maximize the use of available water. The transfer pipeline branches off the Uvas Reservoir outlet pipe and water flows by gravity (there is no pumping involved). The head of water in the reservoir allows for gravity flow in the pipeline since the water surface elevation in the reservoir is much higher than the pipeline discharge point in Llagas Creek. If you'd like more information on this pipeline, please feel free to contact Bassam Kassab, Raw Water Operations Manager. He is copied on this email, or can be reached at 408-630-2091.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

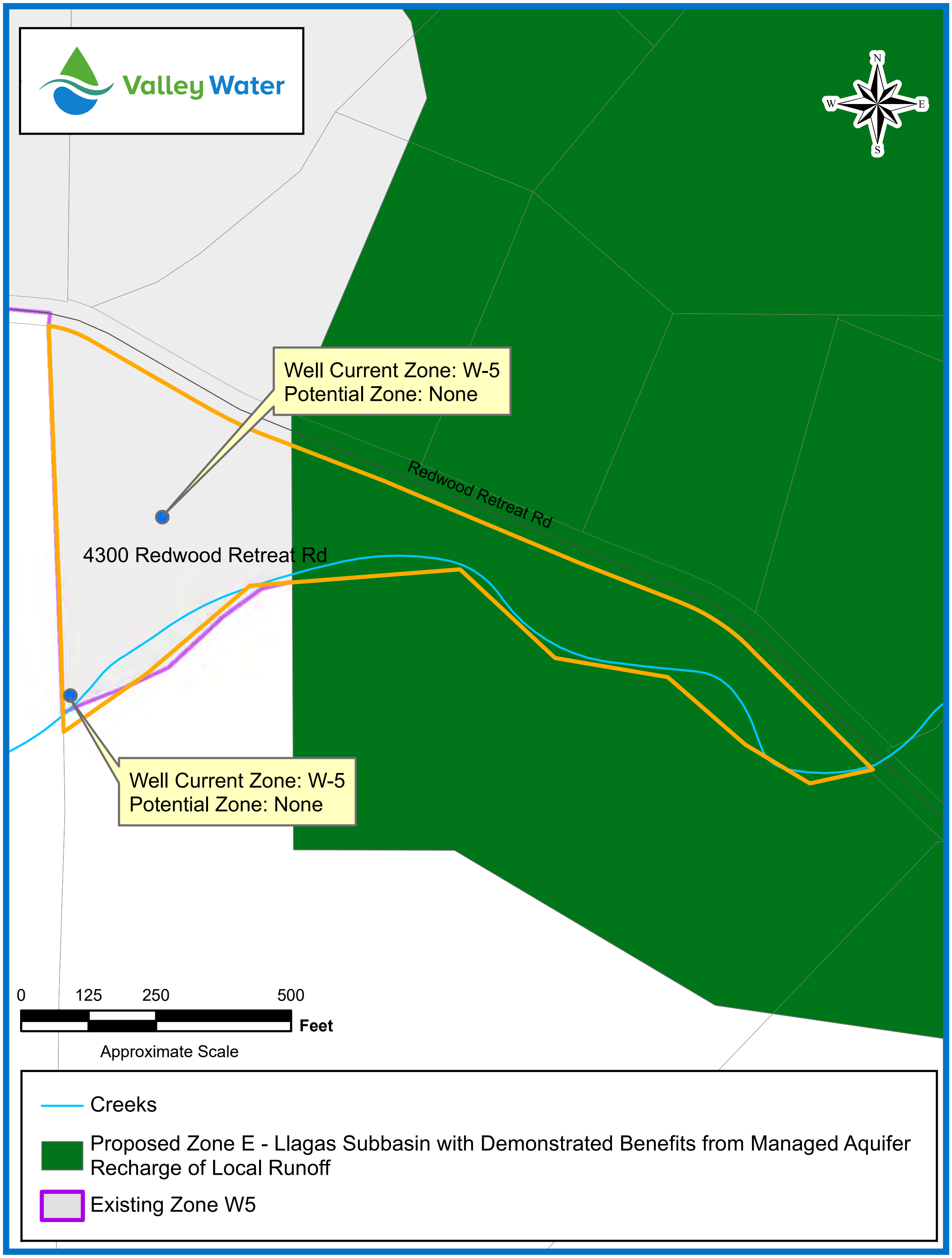
Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

Proposed Groundwater Benefit Zones
4300 Redwood Retreat Rd

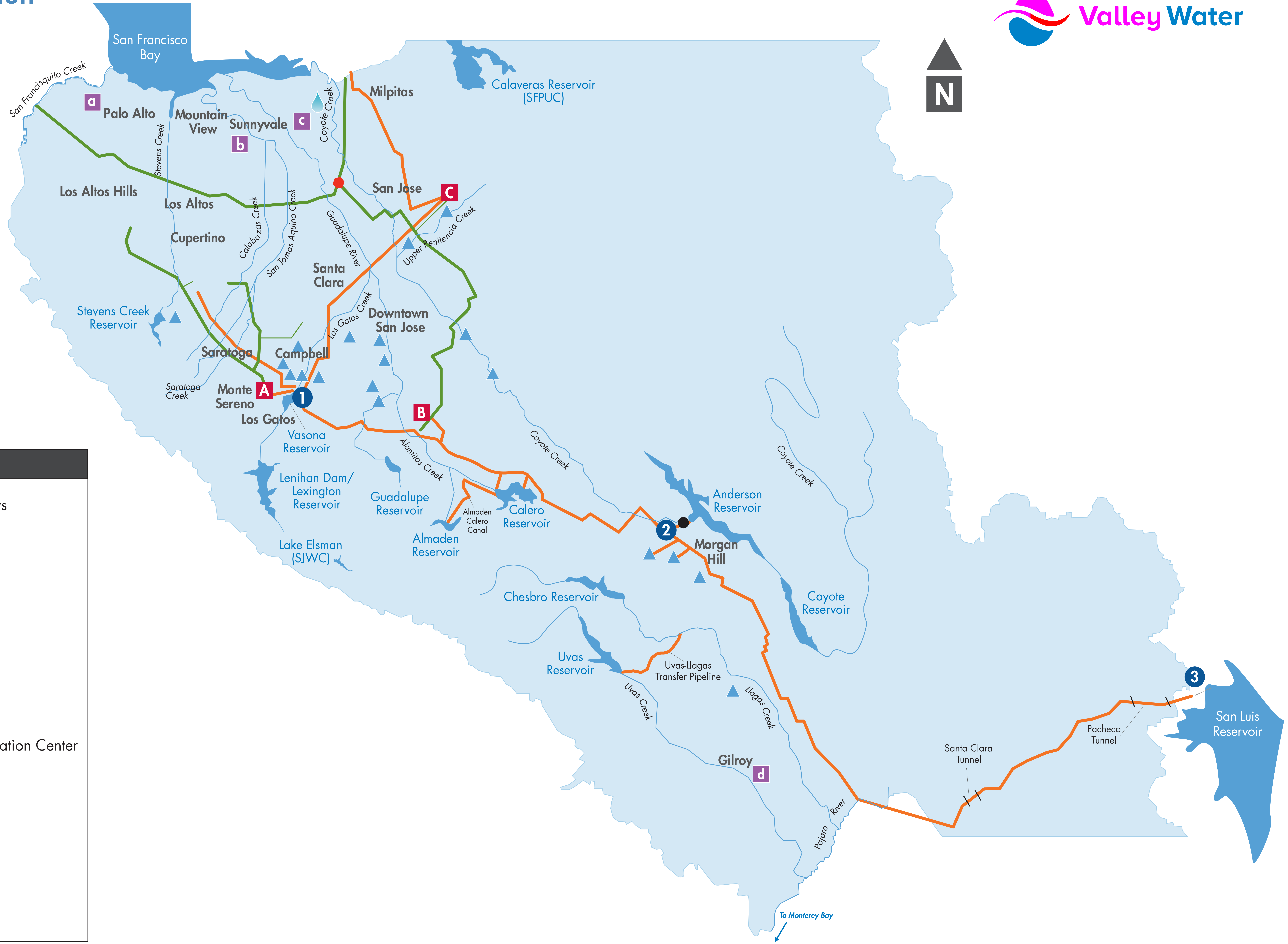


1. Based on zones proposed in Preliminary Zone of Benefit Study Report available at www.valleywater.org/gwbenefits
2. Boundary lines shown are approximate and subject to change. Any change to a groundwater benefit zone must be approved by the Valley Water Board of Directors.

DRAFT - Subject to Change May 2019

Water Supply Distribution Map

Valley Water



Legend

- 〰 Lakes, reservoirs, rivers, creeks, & bays
- — Raw water pipeline
- — Drinking water pipeline
- ● Pump Plants
  1. Vasona
  2. Coyote
  3. Pacheco
- 🟥 Drinking Water Treatment Plants
  - A. Rinconada
  - B. Santa Teresa
  - C. Penitencia
- 💧 Silicon Valley Advanced Water Purification Center
- ● Anderson Hydroelectric Facility
- 🟪 Local wastewater treatment plant and recycled water provider
  - a. Palo Alto
  - b. Sunnyvale
  - c. San Jose-Santa Clara
  - d. South County
- ▲ Recharge Ponds

From: George Cook
Sent: Thursday, May 09, 2019 10:04 AM
To: Dan Musso <dmusso@sbcglobal.net>
Subject: RE: Map of well's

Hi Dan,

I have attached the map showing your parcel, the 2 wells, and the existing and proposed zones. I hope this helps. Please let me know if you have any other questions.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

From: Dan Musso <dmusso@sbcglobal.net>
Sent: Wednesday, May 08, 2019 1:07 PM
To: George Cook <GCook@valleywater.org>
Subject: Re: Map of well's

George,

Just a reminder.
Please send me a copy of the parcel map showing the wells for 4325 Redwood Retreat Road, Gilroy along with the proposed benefit zone when you get a chance.

Thank You,
Dan Musso
408-398-9696

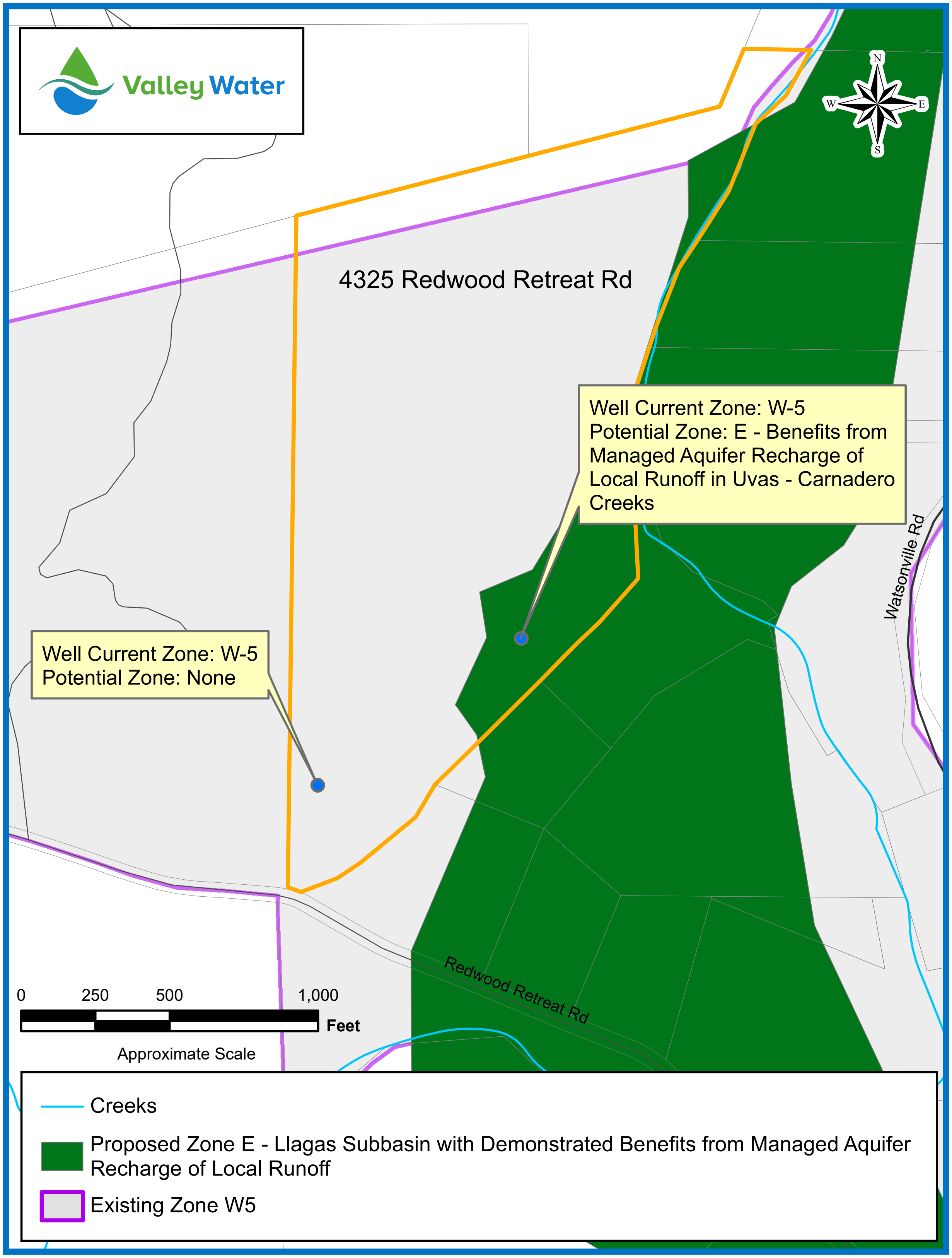
On Monday, May 6, 2019, 11:38:12 AM PDT, Dan Musso <dmusso@sbcglobal.net> wrote:

George,

It was nice speaking to you today.
As discussed on the phone, can you please provide me a copy or my parcel map 756-29-005 w/ the wells shown along with the new proposed benefit zone.

Thank you,
Dan Musso

Proposed Groundwater Benefit Zones
4325 Redwood Retreat Rd

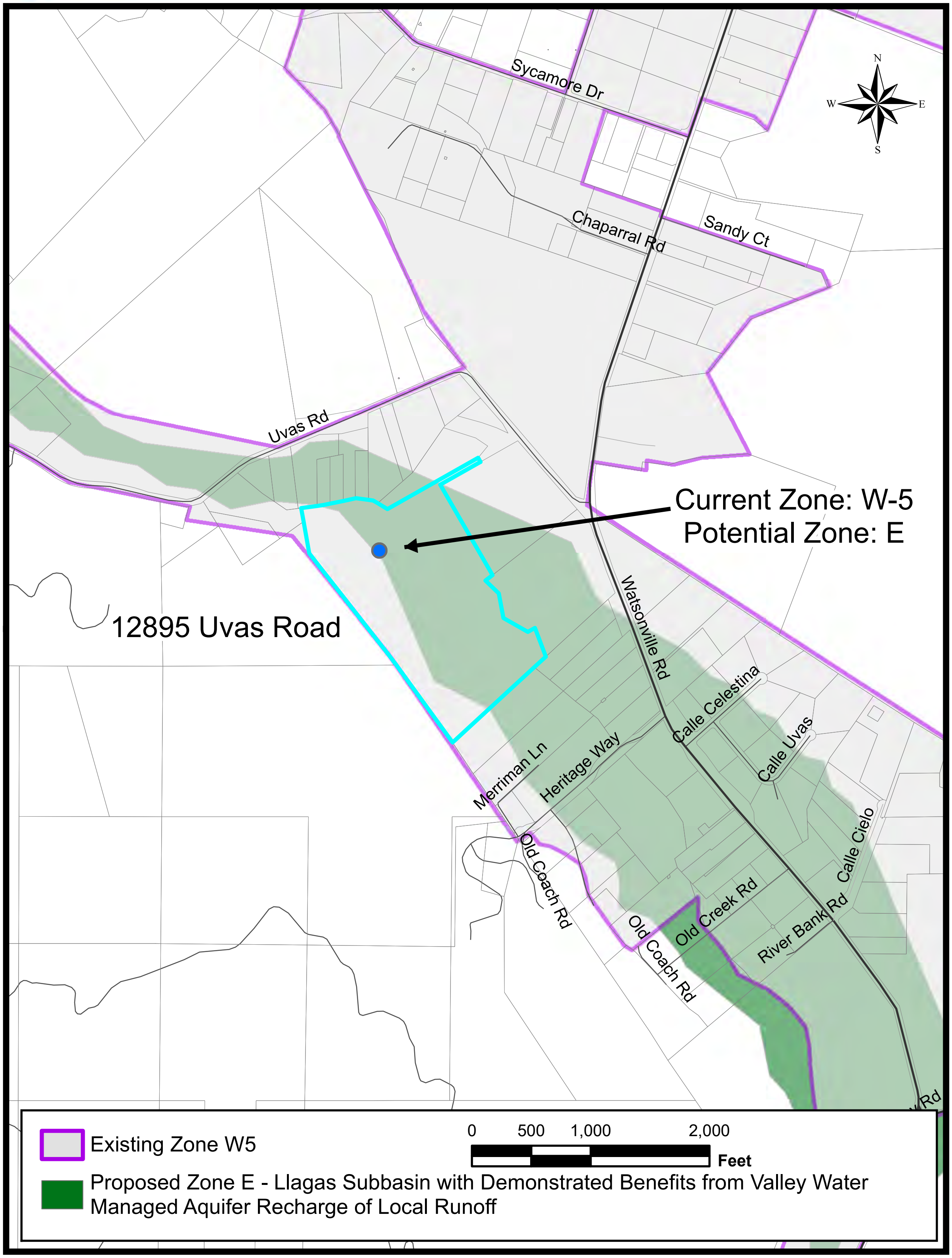

Valley Water
N
W
E
S
4325 Redwood Retreat Rd
Well Current Zone: W-5
Potential Zone: E - Benefits from Managed Aquifer Recharge of Local Runoff in Uvas - Carnadero Creeks
Well Current Zone: W-5
Potential Zone: None
Watsonville Rd
Redwood Retreat Rd
0
250
500
1,000
Feet
Approximate Scale
Creeks
Proposed Zone E - Llagas Subbasin with Demonstrated Benefits from Managed Aquifer Recharge of Local Runoff
Existing Zone W5

1. Based on zones proposed in Preliminary Zone of Benefit Study Report available at www.valleywater.org/gwbenefits
2. Boundary lines shown are approximate and subject to change. Any change to a groundwater benefit zone must be approved by the Valley Water Board of Directors.

DRAFT - Subject to Change

May 2019

Proposed Groundwater Benefit Zones
12895 Uvas Road, Morgan Hill



1. Based on zones proposed in Preliminary Zone of Benefit Study Report available at www.valleywater.org/gwbenefits
2. Boundary lines and wells shown are approximate and subject to change. Any change to a groundwater benefit zone must be approved by the Valley Water Board of Directors.

DRAFT - Subject to Change

May 2019

From: George Cook <GCook@valleywater.org>
Sent: Monday, May 20, 2019 4:18 PM
To: Joyce Chen
Subject: RE: Questions on Groundwater Benefit Zone
Attachments: Chen.pdf

Hi Joyce,

I have attached a map showing your parcel and well. The answers to your questions are below:

What is my current zone?

You are currently in existing groundwater zone W-5, which extends from approximately Metcalf Road in South San Jose to the Pajaro River.

What is the new zone?

If the proposed zones are adopted by the Valley Water Board, your well would no longer be within a groundwater benefit zone. The southeast corner of your property would be included in the proposed zone.

What's the expected change in rate?

The existing well on your property would no longer be subject to the groundwater charges if the proposed zones are adopted. If you decided to place a well in the southeast portion of your property within the proposed zone, it would be subject to the groundwater charges. Any changes to the rates would go into effect in July 2020 at the earliest.

I hope you find this information helpful. Please feel to call or email me if you have any more questions.

GEORGE COOK
SENIOR WATER RESOURCES SPECIALIST
Groundwater Management Unit
Tel. (408) 630-2964

Santa Clara Valley Water District is now known as:

Valley Water

Clean Water • Healthy Environment • Flood Protection

5750 Almaden Expressway, San Jose CA 95118
www.valleywater.org

From: Joyce Chen <10120gilroy@gmail.com>
Sent: Thursday, May 16, 2019 8:58 AM

To: George Cook <GCook@valleywater.org>
Subject: Re: Questions on Groundwater Benefit Zone

Hi, George,

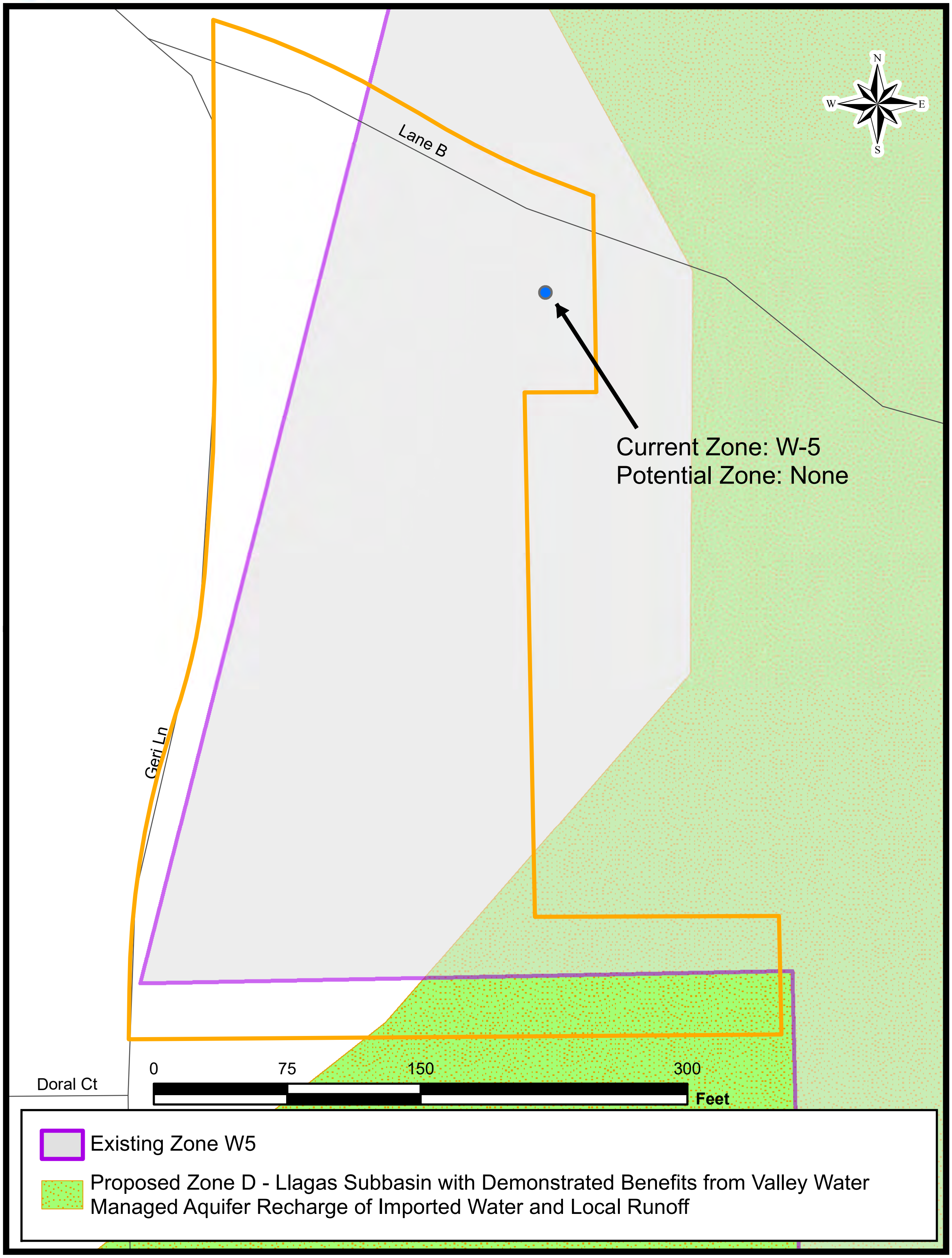
I want to follow up to see if you have recieved my email from a few days ago. Can you please tell me the status of our property based on the new water zone?

Thanks
Joyce

On Sat, May 11, 2019, 8:48 AM Joyce Chen <10120gilroy@gmail.com> wrote:

> George Cook,
>
> I am contacting you in regards to the new Groundwater Benefit Zone. My property is on the border of the zone line on https://gis.valleywater.org/ZoB/. In fact, the line cuts through the property (screenshots attached).
>
> Can you tell me what impacts the new Groundwater Benefit Zone will have on my property?
>
> - What is my current zone?
> - What is the new zone?
> - What's the expected change in rate?
>
> APN: 783-15-057
> Has one well for residential use on property and makes annual payment via well statement.
>
> Thank you for your help.
> Joyce

Proposed Groundwater Benefit Zones
Chen Property


Lane B
Geri Ln
Doral Ct
Current Zone: W-5
Potential Zone: None
N
S
E
W
0
75
150
300
Feet
Existing Zone W5
Proposed Zone D - Llagas Subbasin with Demonstrated Benefits from Valley Water Managed Aquifer Recharge of Imported Water and Local Runoff

1. Based on zones proposed in Preliminary Zone of Benefit Study Report available at www.valleywater.org/gwbenefits
2. Boundary lines and wells shown are approximate and subject to change. Any change to a groundwater benefit zone must be approved by the Valley Water Board of Directors.

DRAFT - Subject to Change

May 2019

Valley Water

Clean Water • Healthy Environment • Flood Protection

April 9, 2020

Subject: Announcement of Public Hearing: April 28, 2020

Dear Well User:

The Santa Clara Valley Water District (Valley Water) wants to update you on proposed changes that may affect you as an owner or operator of groundwater wells (well user). If you do not use a groundwater well as part of your water supply, please disregard this notice.

Areas benefiting from Valley Water's groundwater management activities are divided into different geographical zones, called groundwater benefit zones. Groundwater charges (rates charged for pumping groundwater) differ for each zone since they depend on the set of activities benefitting each specific area. From time to time, we review the zones to make sure they reflect current conditions.

Valley Water hired a team of experts to complete a scientific study of the zones and conducted robust community outreach which was completed in September 2019. After considering the technical study and well user input, Valley Water is proposing some zone changes to ensure well users pay a fair, equitable rate for pumped groundwater based on the benefits received. If the proposed changes are adopted, the zones and related groundwater production charges will change. Please note that this change does not increase Valley Water's total revenue.

The Valley Water Board of Directors will hold a public hearing on April 28, 2020, to consider adopting proposed new and modified groundwater benefit zones. Information on how to view or participate in the April 28, 2020, public hearing will be posted with the agenda at https://delivr.com/2saec. You can subscribe to receive agenda notifications or submit public comments from the same webpage. You can also email your comments to the Clerk of the Board at clerkoftheboard@valleywater.org. Comments received by noon on the day before the meeting will be shared with Board members during their discussion on the item.

To learn more about how the proposed changes or how they might affect you as a well user, please see the list of resources on the back of this page. You can also contact Project Manager George Cook at (408) 630-2964 or gcook@valleywater.org with any questions.

Sincerely,

Norma J. Camacho
Chief Executive Officer

Attachment: North and South County Groundwater Benefit Zone Maps and Frequently Asked Questions (Updated March 2020)

jv:fd
0409a-l

Where to find additional Information on the Groundwater Benefit Zone Study:

- Frequently asked questions and maps showing the proposed changes are attached.
- Our Groundwater Benefit Zone Web App at https://gis.valleywater.org/ZoB/ allows you to search by address, well, or parcel to find information on the proposed zones and preliminary cost estimates.
- Additional information on the study, including the preliminary study report and the sign up for study updates, is available on our website at: www.valleywater.org/gwbenefits.
- Project Manager George Cook can be reached at (408) 630-2964 or gcook@valleywater.org.

Si habla español y tiene preguntas sobre el contenido de este mensaje por favor de comunicarse con José Villarreal al JVillarreal@valleywater.org o (408) 630-2879.

Nếu bạn nói tiếng Việt và có thắc mắc về nội dung của thông báo này, xin vui lòng liên hệ với Hoan Cutler HCutler@valleywater.org hoặc (408) 630-3135.

如果你說中文並對上述訊息有疑問, 請聯繫 Julia Tat, 電郵 jtat@valleywater.org, 或者電話:
(408) 630-3168.

MONTGOMERY
& ASSOCIATES

Appendix L

Record of Survey for Metes and Bounds

Filed by Santa Clara County Recorder on May 4, 2021 and Clean Version Submitted to Santa Clara County Surveyor’s Office on June 30, 2020

MONTGOMERY
& ASSOCIATES

Appendix L-1

Simplification of Boundaries and Boundary Uncertainty

HydroMetrics WRI

1814 Franklin St, Suite 501
Oakland, CA 94612

DRAFT TECHNICAL MEMORANDUM

To: George Cook, Santa Clara Valley Water District

From: Cameron Tana and Georgina King

Date: October 31, 2017

Subject: Possible Approach to Simplification of Boundaries and Boundary Uncertainty

1. BACKGROUND

Technical Review Committee member Rebecca Nelson commented on the preliminary zone of benefit study on August 4, 2017 as follows:

> **Issue: simplification of boundaries**
> I understood the practical need to simplify complicated boundaries dictated by geology into something more amenable to efficient legal description. To help justify this process, it would be useful to give some indication/evidence of the difficulty/cost of having legal descriptions that mirror geological boundaries to head off any argument about arbitrariness of the simplified boundaries.
>
> I saw this as an area of particular challenge in terms of minimizing the number of pumpers on the margins of charge zones who might want to challenge the drawing of the boundaries. It seems desirable to try to head off as many of these challenges as possible at the outset. It would be possible to draw a link between the simplification of boundaries, and a spatial representation of the uncertainty of boundaries (see below), eg if a parcel of land lies mostly within an 'error band' around a particular boundary, a conservative approach may be to exclude it from a charge zone. This could be contrasted with a parcel of land, most of which lies within an area of high confidence as being within a zone of benefit on the basis of geology.
>
> **Issue: explicit treatment of uncertainty**
> It is worth mentioning that policy-related reports about groundwater seem to have an increasing tendency explicitly to reflect information about uncertainty, and

> how the uncertainty has been dealt with. Here, I distinguish uncertainty (eg relating to geological interpretation or using production wells for monitoring purposes) from conservative assumptions in terms of benefits (which I understand was the approach of the report). This is an unusual context for considering uncertainty, since it would not deal with uncertainty in terms of a variation in groundwater levels or volumes, but variation in a spatial boundary. I'm not entirely sure how one would represent it - but it would be worth some consideration. See one idea about the potential application of this to simplification of boundaries above.

This technical memorandum describes a possible approach to addressing these comments when simplifying boundaries for legal descriptions.

2. POSSIBLE APPROACH TO SIMPLIFICATION

As a response to this comment, we propose that simplification of boundaries does not result in any well included in a zone of benefit or a zone of benefit with higher groundwater charges as a result of the simplification. First note that simplification will only be applied to zone boundaries based on geologic boundaries as other boundaries such as the County, basin boundaries, and delivery areas generally consist of straight line segments. Therefore, we propose the simplified boundary will lie within the mapped geology that defines the zone of benefit. No well that is outside the mapped geology that defines the zone will be in the zone. This does mean there could be wells located in the mapped geology that could be excluded from the zone. This is a conservative approach given the uncertainty of the mapped geologic boundaries.

2.1. Possible Steps for Simplification

The methodology below details how this possible approach will be implemented. The methodology involves two basic steps:

1. Simplify the boundaries based on mapped geology using the Douglas-Peucker algorithim using a tolerance of 50 feet.
2. Shift simplified boundaries inwards at least 50 feet reducing size of zone.

A 50 foot simplification tolerance is selected to reduce number of line segments of the largest Zone A to under 2,000 line segments. Current Zone W-2 has approximately 1,750 line segments so a 50 foot tolerance achieves a similar level of generalization as the current zones. These are more lines than requested by Towill in its draft scope of work for defining metes and bounds (attached) for the largest zones so the cost of Towill's scope may be higher than estimated. This higher cost may be offset by the zones smaller than Zone A having less lines than the Towill assumptions.

With respect to step 2, boundaries are shifted inwards into the zone if the boundary is with non-zone area, i.e., at the outer edge of the total area of zones of benefit. If the boundary is between two zones, the boundaries are shifted inwards into the zone that is expected to have a higher groundwater charge because it is demonstrated to have benefits from more District activities:

- Where Zone A (treated water delivery and managed recharge) shares geologic boundaries with Zones B1 and B2 (treated water delivery only) and Zone C (managed recharge only), boundaries will be shifted into Zone A.
- Where Zone D (managed recharge from local runoff and imported water) shares geologic boundaries with Zone E (managed recharge from imported water), boundaries will be shifted into Zone D.

An inward shift of at least 50 feet was selected so that the simplified boundary would always be within the unsimplified zone of benefit boundary and within the mapped geologic boundary. An inward shift of greater than 50 feet could abe used that accounts for uncertainty, as discussed below.

2.2. Simplification Methodology Details

The polygon boundaries representing the zones of benefit will be simplified into a version with a reduced number of line segments to facilitate the creation of a zone boundary legal description or metes and bounds. The Douglas-Peucker algorithm in ArcMap will be used to simplify the zone of benefit boundaries. This algorithm retains critical points by identifying and removing relatively redundant vertices to simplify data. The algorithm is based on the Douglas-Peucker algorithm: Douglas, David and Peucker, Thomas, "Algorithms for the reduction of the number of points required to represent a digitized line or its caricature," The Canadian Cartographer. 10(2), 112–22 (1973). This simplification algorithm is preferred over the Wang-Müller algorithm also available in ArcMap. The Wang-Müller algorithm identifies and eliminates relatively insignificant bends to simplify data. Although it is more faithful to the input geometry than the Douglas-Peucker algorithm, its level of simplification is not enough for a simplified version that needs to limit the number of straight lines in the largest zone boundary (Zone A) to under 2,000 lines.

The simplification tolerance parameter value in the simplification algorithm determines the degree of simplification. The larger the tolerance, the more coarse the resulting geometry is. Smaller tolerances generate geometry more faithful to the input. Preliminary tests indicate that a tolerance of 50 foot may be optimal. This will limit the simplified polygons to being no more than 50 feet away from the unsimplified polygon boundaries. Once the simplification algorithm has been run, the outermost boundaries of the simplified lines will have some portions that are outside of the original polygons (but not more than 50 feet). These are areas where the unsimplified polygons are concave. To ensure that the simplified line is always within the unsimplified charge zone polygon and the mapped geology, we propose to shift the outermost boundaries inwards by at least 50 feet. This will ensure that wells within any zone are located where geology associated with the zone is mapped.

3. ACCOUNTING FOR UNCERTAINTY OF GEOLOGIC BOUNDARIES

In response to Rebecca Nelson's second comments, we attempt to identify uncertainty associated with the boundaries that define the preliminary zones of benefit. Then, we propose an adjustment to the simplification approach that accounts for uncertainty.

3.1. Sources of Uncertainty Associated with Zone Boundaries

Geologic boundaries on a map have several sources of uncertainty (Lark et al. 2015):

1. Conceptual uncertainty is "the uncertainty attached to a mapped boundary which represents a division of spatially continuous variation rather than a contact between two unambiguously different geological units". For example, this would occur where there is a lateral facies change.
2. Scale-dependent uncertainty occurs because "Even where a boundary is conceptually unambiguous, the precise position at which it should be described as a continuous line may depend on the spatial scale at which it is observed, and entails some degree of generalization of fine-scale variation".
3. Cartographic uncertainty is introduced when the geologist's mapped boundaries are converted to a cartographic product.
4. Interpretation uncertainty is the most obvious of the uncertainties and occurs when direct observation of a contact is not possible. Over most of the mapped length of a boundary, the line position is based on the mapper's interpretation of available information. Available information includes direct observation, geophysical surveys, inferring between observations, using constraining information such as topography. Therefore, the mapped position of the boundary is the geologist's best expert interpretation of the available information.

Conceptual, scale-dependent and cartographic uncertainty certainly exist in the geologic data from which the draft charge zones were derived, however they are not quantified by their mappers. Some of the data do have the interpreted uncertainty provided in map documentation or metadata. The table below summarizes the sources of data used to derive the draft charge zones. Some of these data have interpretation uncertainty specified in their map documentation or metadata, others have no mention of uncertainty.

Data Source	**Uncertainty Specified in Map Documentation**		**Measure of Uncertainty**
Bedrock-Alluviumcontact	1. contact, well located = depositional contact, location uncertainty less than about ±100 m 2. contact, approx. located = depositional contact, location uncertainty greater than about ±100 m		Attribute of each line in dataset from USGS
Geology (Santa Clara Formation and bedrock contacts)	San Jose 1:100,000 1. contact, certain 2. contact, approx. located 3. contact, inferred 4. contact, inferred, queried 5. contact, concealed No other uncertainty metrics are provided in map documentation or metadata	Palo Alto 1:24,000 1. contact, certain 2. contact, approx. located 3. contact, concealed No other uncertainty metrics are provided in map documentation or metadata	Not available
SCVWD Treated Water area	The boundaries used for treated water areas were from a number of sources, some of which likely do not correspond with parcel boundaries. Reducing uncertainty of these areas could occur during process of defining metes and bounds.		Not available
County	None – county line represents the true limit of the zone		No uncertainty
Alluvial cut offs	These were delineated based on evaluation of surface elevation but removes areas of alluvium from the zone so more likely to conservatively exclude wells that benefit		Not available
DWR Basin boundary at Coyote Narrows	The DWR basin boundary is based on the groundwater divide which changes over time. However, the basin boundary itself is a defined		No uncertainty

	legal boundary and represents the true boundary of the zone	

We have identified that the SCVWD treated water area data used for the draft charge zones is not fully accurate. Although, there is no measure of uncertainty for those boundaries, ensuring that the boundary aligns with the served parcels will improve accuracy and uncertainty considerably.

3.2. Adjustments to Possible Simplification Approach to Account for Uncertainty

In conclusion, we propose the following:

1. Shift simplified geologic boundaries by 100 meters inwards, instead of the 50 foot inward shift in the GIS example provided. The metric of 100 meters is the only measure of uncertainty we have in the geological data used to derive the draft charge zones.
2. Use unsimplified County boundary in north.
3. Use unsimplified DWR basin boundary at Coyote Narrows
4. Use parcel boundaries to delineate treated water areas. This will mean those boundaries will not need to simplified or shifted inwards.
5. Use unsimplified alluvial cutoffs.

4. REFERENCES

Lark, R. M., R. S. Lawley, A. J. M. Barron, D. T. Aldiss, K. Ambrose, A. H. Cooper, J. R. Lee, and C. N. Waters. 2015. *Uncertainty in mapped geological boundaries held by a national geological survey: eliciting the geologists' tacit error model.* Solid Earth, 6, p. 727–745. Web access: https://www.solid-earth.net/6/727/2015/se-6-727-2015.pdf

Preliminary geologic map of the San Jose 30 x 60 minute quadrangle, California. 1999. https://pubs.usgs.gov/of/1998/of98-795/of98-795_2a.txt

Geologic map and map database of the Palo Alto 30' X 60' quadrangle, California. 2000. https://pubs.usgs.gov/mf/2000/mf-2332/mf2332p.pdf

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

elmontgomery.com
1970 Broadway, Suite 225
Oakland, CA 94612
510.903.0458

TECHNICAL MEMORANDUM

DATE: August 15, 2019 PROJECT #: 9300.0606

TO: George Cook, Santa Clara Valley Water District

FROM: Cameron Tana

PROJECT: Valley Water Benefit Zone Study

SUBJECT: Implementation of Boundary Simplification and Modifications for Uncertainty

INTRODUCTION

Appendix J of the *Preliminary Groundwater Benefit Zone Study* (Montgomery & Associates, August 2019) report includes a technical memorandum titled "Possible Approach to Simplification of Boundaries and Boundary Uncertainty" that describes a possible approach to modifying the basin boundaries to meet the following two objectives:

1. Facilitate development of legal descriptions of the benefit zone boundaries with metes and bounds by simplifying the boundaries to reduce the number of line segments that make up the boundaries.
2. Account for geologic uncertainty.

This memorandum describes implementation of the approach in developing the proposed benefit zones. In general, the approach was implemented as described in the October 2017 memo, but additional adjustments were made. This memorandum will be added to Appendix J of the *Groundwater Benefit Zone Study* report to be presented to the Valley Water Board of Directors.

IMPLEMENTATION STEPS

The implementation steps were as follows:

1. Simplify the boundaries based on mapped geology using the Douglas-Peucker algorithim using a tolerance of 50 feet.

2. Shift simplified geologic boundaries by 100 meters inwards based on the only measure of uncertainty available in the geological data used to derive the draft benefit zones. This is the uncertainty specified in the USGS mapping of the bedrock-alluvium contact.

3. Remove "islands" created by the inward shift in step 2 that become disconnected with District activities. Figure 1 provides an example of this step. Step 2 removed the light blue area from Zone A, which left pink "islands" removed by this step.

4. Adjust Zone E boundaries with alluvium not directly downstream of District reservoirs such that they are at least 100 meters away from mapped bedrock/alluvium contact to account for geologic uncertainty. Figure 2 shows implementation of this step. Steps 1 and 2 removed the light blue areas from Zone E and this step removed the pink areas.Figure 1

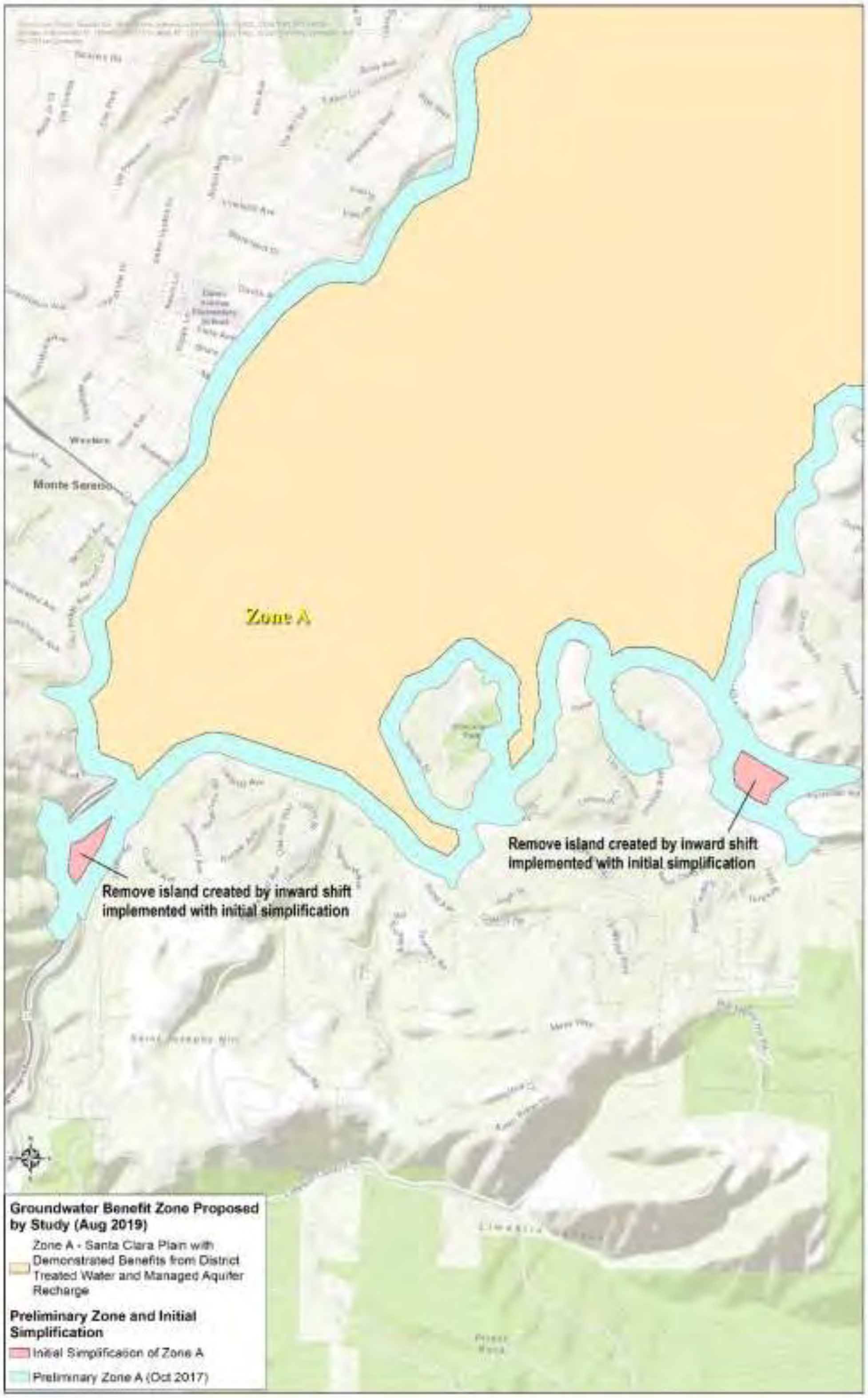
5. Use unsimplified boundaries for treated water delivery areas based on GIS files provided by retailers. After shift of step 2, adjustments were required to ensure all treated water delivery areas were covered by zone A, B1, or B2 because groundwater users in these areas benefit from in-lieu recharge.

6. Reduce zone areas based on well logs indicating the well is screened in bedrock. This step is described in further detail in the next section.

7. Use the unaltered northern and southern Santa Clara County boundaries in north and south which represents the related extent of the District jurisdiction and subbasin boundaries.

8. Use the unaltered boundary between existing zones W-2 and W-5 at the Coyote Narrows to delineate the boundary between zones A and C.

9. Use the unaltered DWR boundary between the Santa Clara and Llagas Subbasins to delineate the boundary between zones C and D.


Zone A
Monte Sereno
Groundwater Benefit Zone Proposed by Study (Aug 2019)
Zone A - Santa Clara Plain with Demonstrated Benefits from District Treated Water and Managed Aquifer Recharge
Preliminary Zone and Initial Simplification
Initial Simplification of Zone A
Preliminary Zone A (Oct 2017)

Remove island created by inward shift implemented with initial simplification

Remove island created by inward shift implemented with initial simplification

Figure 1. Example of Implementation Step #3: Removal of “Islands” Created by Inward Shift

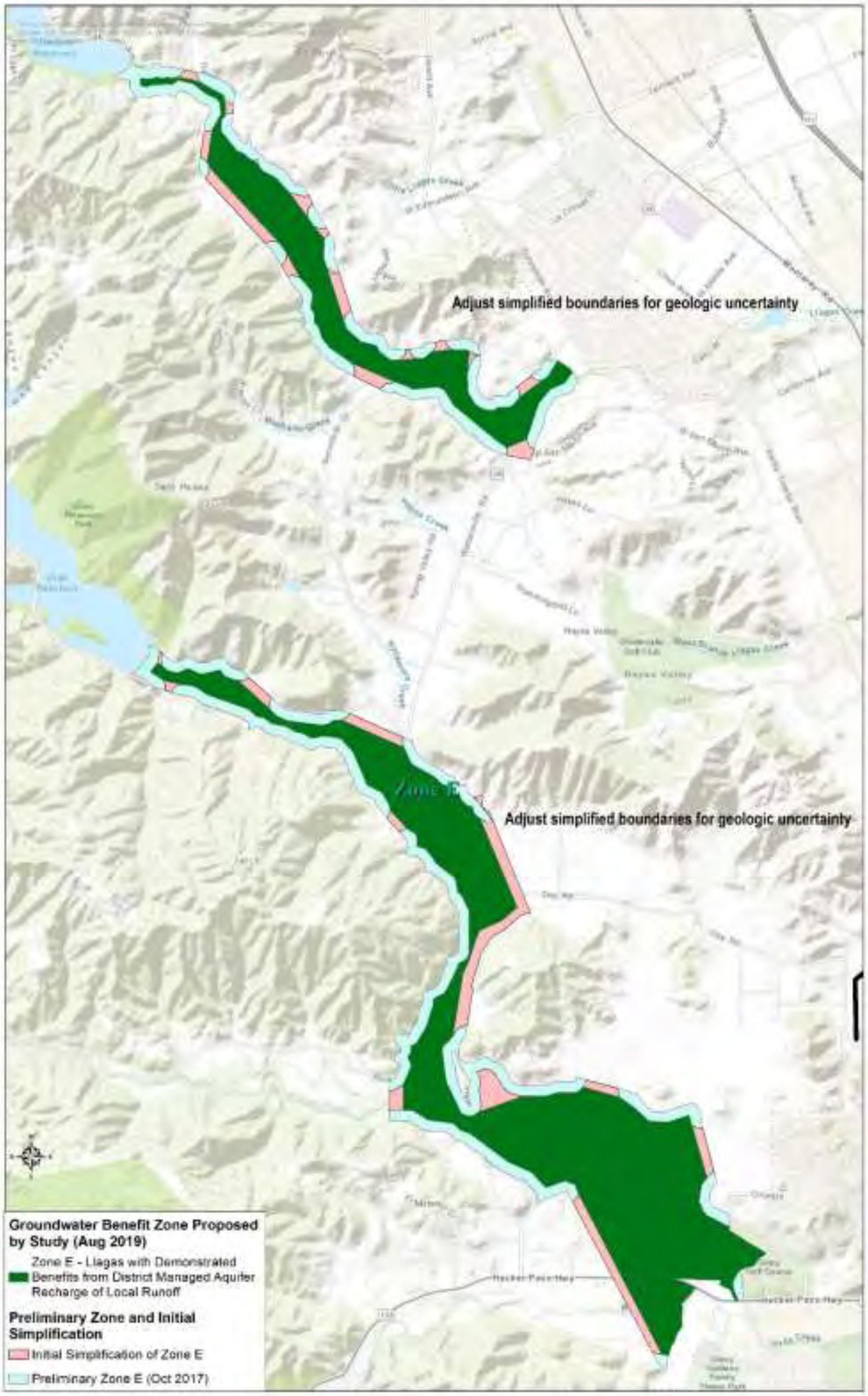
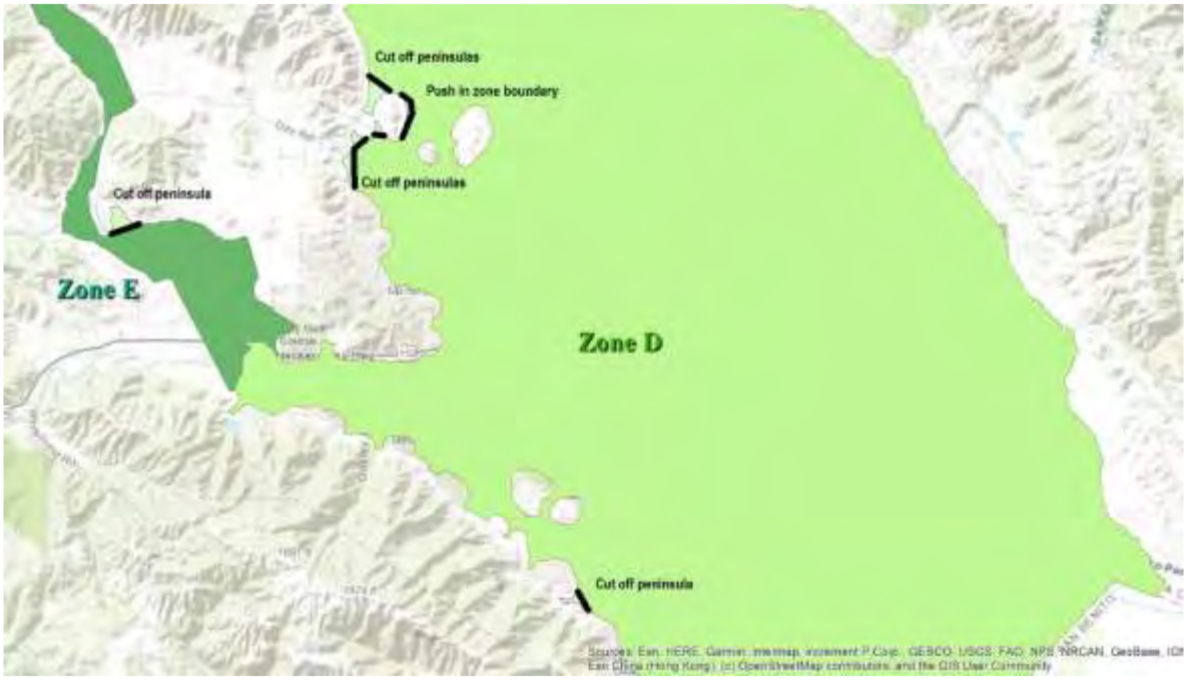

Adjust simplified boundaries for geologic uncertainty
Zone E
Adjust simplified boundaries for geologic uncertainty
Groundwater Benefit Zone Proposed by Study (Aug 2019)
Zone E - Llagas with Demonstrated Benefits from District Managed Aquifer Recharge of Local Runoff
Preliminary Zone and Initial Simplification
Initial Simplification of Zone E
Preliminary Zone E (Oct 2017)

Figure 2. Implementation Step #4: Adjust Zone E Boundaries for Geologic Uncertainty

REDUCTION OF ZONE AREAS BASED ON WELL LOGS INDICATING BEDROCK

Step 6 above includes an additional evaluation beyond the originally proposed approach. In May 2019, the District provided 28 well logs for wells added to benefit zones based on steps 1-5, wells on the other side of the boundary from the added wells, and for a well whose owner previously requested exemption. Some of these logs indicate that the wells are screened in bedrock. In general, wells are considered screened in bedrock if the majority of the well screening was present in consolidated geologic material. Many of these wells are present in formations consisting of serpentine, shale, or strongly consolidated alluvium such as sandstone or mudstone. The assessment was based on geology of the actual screened intervals, rather than the borehole log as a whole.

Wells with logs indicating that they are screened in bedrock were removed from the zones by removing areas including the well locations. These areas included peninsulas of Zones D and E which were cut off to reduce the areas of Zones D and E. One well was removed by shifting the boundary of Zone D in from bedrock approximately 100 feet (Figure 3). In a treated water delivery area near Guadalupe Creek, a well was removed by cutting off a peninsula of Zone A to reduce the area of Zone A and increase the area of Zone B2 (Figure 4).



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 3. Areas Removed from Zones D and E for Wells Screened in Bedrock

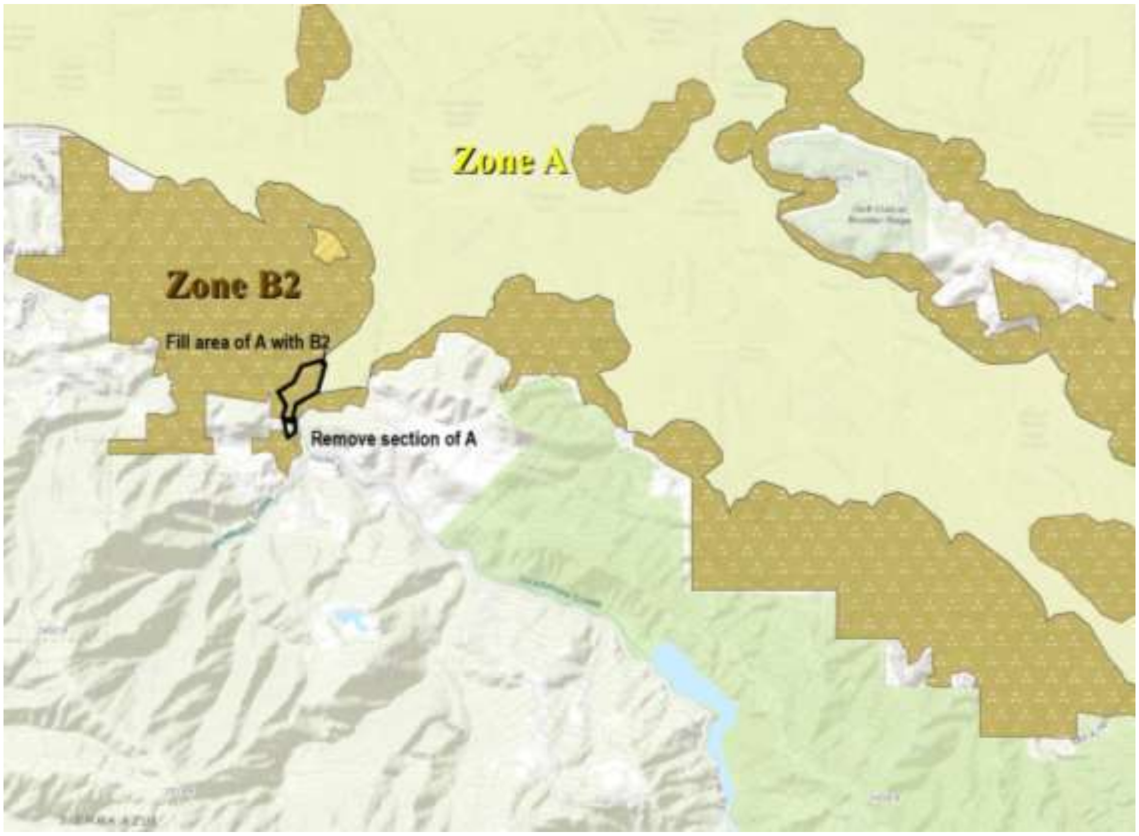


Figure 4. Areas Modified in Zones A and B2 for Well Screened in Bedrock

SUMMARY OF BOUNDARY CHANGES

Table 1 summarizes where boundary adjustments were made for simplification and uncertainty purposes.

Table 1. Summary of Boundary Adjustments for Simplification and Uncertainty

Area 1	Area 2	Boundary	Simplification by Douglas-Peucker	Shift for Uncertainty	Adjust for Logs of Bedrock Well
Zone A	San Mateo County	County Line	No	No	No
Zone A	Non-Zone Alluvium	Alluvial Cutoff	No	No	No
Zone A	Non-Zone Bedrock	Unconsolidated Alluvium-Bedrock	Yes	Reduce Zone A	No
Zone A	Zone B1	Unconsolidated Alluvium-Santa Clara Formation	Yes	Reduce Zone A, Enlarge Zone B1	No
Zone A	Zone B2	Unconsolidated Alluvium-Bedrock	Yes	Reduce Zone A, Enlarge Zone B2	Reduce Zone A, Enlarge Zone B2
Zone A	Zone C	Zone W2-Zone W5	No	No	No
Zone B1	Non-Zone Alluvium	Alluvial Cutoff	No	No	No
Zone B1	Non-Zone Bedrock	Santa Clara Formation-Bedrock	Yes	Reduce Zone B1	No
Zone B1	Zone B2	Santa Clara Formation-Bedrock	Yes	Reduce Zone B1, Enlarge Zone B2	No
Zone C	Non-Zone Alluvium	Alluvial Cutoff	No	No	No
Zone C	Non-Zone Bedrock	Unconsolidated Alluvium-Bedrock	Yes	Reduce Zone C	No
Zone C	Zone D	DWR Santa Clara - Llagas Subbasin Boundary	No	No	No
Zone D	Non-Zone Alluvium	Alluvial Cutoff	No	No	No
Zone D	Non-Zone Bedrock	Unconsolidated Alluvium-Bedrock	Yes	Reduce Zone D	Reduce Zone D
Zone D	Zone E	Morgan Hill and Gilroy Boundaries	No	No	No
Zone D	San Benito County	County Line	No	No	No
Zone E	Non-Zone Alluvium	Alluvial Cutoff	No	Reduce Zone E	N
Zone E	Non-Zone Bedrock	Unconsolidated Alluvium-Bedrock	Yes	Reduce Zone E	Reduce Zone E

MONTGOMERY
& ASSOCIATES

Appendix L-2

Description of Approach to Metes and Bounds

TOWILL
SURVEYING | MAPPING | GIS

March 10, 2017

Cameron Tana, P.E.
Vice President
HydroMetrics Water Resources Inc
1814 Franklin Street, Suite 501
Oakland, CA 94612
Phone 510.903.0458, extension 302
E-mail: cameron@hydrometricswri.com

RE: Legal Descriptions for SCVWD Ground Water Charge Zone Study
REV2

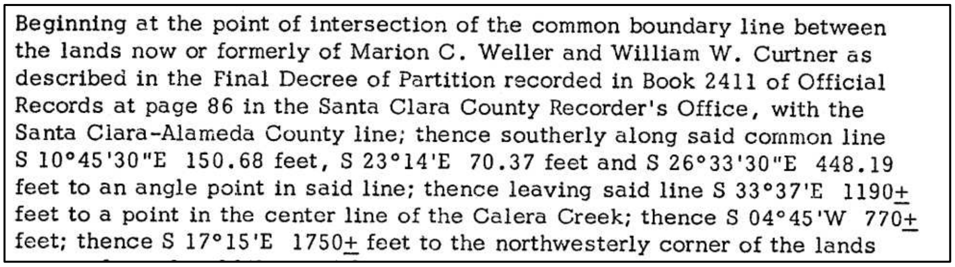
Mr. Tana,

This letter is to detail the approach and cost related to preparing legal descriptions to support the Santa Clara Valley Water District Ground Water Charge Zone Study.

First, a note about the purpose of a legal description. In "Writing Legal Descriptions" from Gurdon Wattles (the standard resource used by surveying professionals regarding how to properly write a legal description), he states in his Preface that writing a legal description "is specifically directed to and for the purpose of delineating a certain area of land or space which cannot apply to such a condition anywhere else". In other words, the successful legal description described an area without question as to the area of intention.

Most legal descriptions are prepared either to support the transfer of properties or easements that encumber such properties. As such, they will have descriptions that tie to property lines and will affect a very small area.

We were provided a copy of the previous legal descriptions done in the 1970's. These legal descriptions comply with the requirement set forth by Wattles, that they describe a singular piece of property. These legal descriptions did so by making 'calls' to existing boundary lines, a small section of which is in the graphic below:



Beginning at the point of intersection of the common boundary line between the lands now or formerly of Marion C. Weller and William W. Curtner as described in the Final Decree of Partition recorded in Book 2411 of Official Records at page 86 in the Santa Clara County Recorder's Office, with the Santa Clara-Alameda County line; thence southerly along said common line S 10°45'30"E 150.68 feet, S 23°14'E 70.37 feet and S 26°33'30"E 448.19 feet to an angle point in said line; thence leaving said line S 33°37'E 1190± feet to a point in the center line of the Calera Creek; thence S 04°45'W 770± feet; thence S 17°15'E 1750± feet to the northwesterly corner of the lands

To replicate such an effort would be labor intensive and require substantial attention from a Licensed Land Surveyor, adding additional costs. We explored different options in an attempt to mitigate costs.

Our proposed approach is to prepare a metes and bounds description of the perimeter based on linework derived from the GIS lines, and to not make 'calls' to existing boundary lines. We will comply with Wattles requirement of describing a specific piece of land by using bearings and distances on California State Plane Coordinate System Zone 3, and have all legal descriptions "Commence", or begin at an existing NGS monument that Towill has recently surveyed as part of other nearby projects, and has confirmed as being in the correct geodetic location.

MONTGOMERY
& ASSOCIATES

Appendix L-3

Record of Survey for Metes and Bounds filed by Santa Clara County Recorder on May 4, 2021 followed by clean version submitted to Santa Clara County Surveyor's Office on June 30, 2020

SURVEYOR'S STATEMENT

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE PROFESSIONAL LAND SURVEYORS ACT AT THE REQUEST OF SANTA CLARA VALLEY WATER DISTRICT IN FEBRUARY, 2020.

FRANK A. BORGES, PLS
PLS NO. 7922

No. 7922
Exp: 12-31-21

COUNTY SURVEYOR'S STATEMENT

THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE PROFESSIONAL LAND SURVEYOR'S ACT THIS 26th DAY OF APRIL, 20~~20~~ 21.

AUGUST HANKS, COUNTY SURVEYOR
PLS NO. 9274

JEREMY KOENIG, DEPUTY COUNTY SURVEYOR
PLS NO. 9394

JEREMY D KOENIG
PLS 9394

RECORDER'S STATEMENT

FILED THIS 4th DAY OF May, ~~2018~~ 2021, AT 1:44pm, IN BOOK 938 OF MAPS AT PAGE(S) 3-23, AT THE REQUEST OF TOWILL, INC.

REGINA ALCOMENDRAS
SANTA CLARA COUNTY RECORDER

BY: N. Benavidez
DEPUTY COUNTY RECORDER

FILE NO.: 24948411 FEE: $ 123-

SURVEYOR'S NOTES

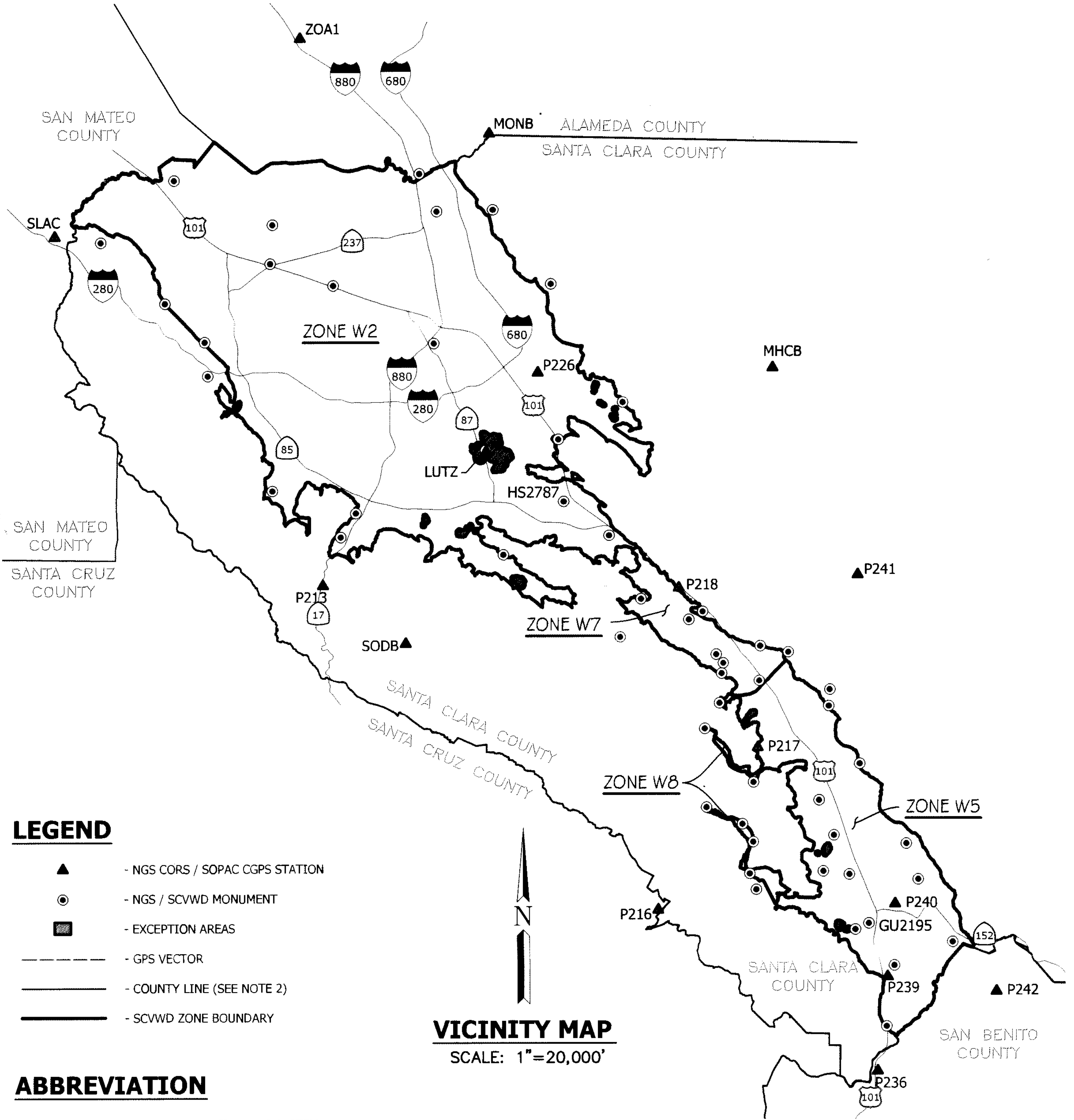
1. THIS SURVEY DOES NOT ESTABLISH OR REPRESENTS ANY BOUNDARY LINES, COUNTY BOUNDARY LINES OR ANY OTHER REAL PROPERTY LINES.
2. THE COUNTY BOUNDARY LINES SHOWN ARE APPROXIMATE AND WERE DERIVED FROM BEST DIGITAL DATA AVAILABLE AT THE TIME OF THIS SURVEY.

RECORD REFERENCES

(1) CALIFORNIA SPATIAL REFERENCE CENTER

(2) FOUND NGS MONUMENT AS DESCRIBED IN NGS DATASHEET

(3) FOUND SCVWD BENCHMARK AS DESCRIBED IN VERTICAL DATABASE REPORT



VICINITY MAP

SCALE: 1"=20,000'

LEGEND

▲ - NGS CORS / SOPAC CGPS STATION
◎ - NGS / SCVWD MONUMENT
▨ - EXCEPTION AREAS
------ - GPS VECTOR
——— - COUNTY LINE (SEE NOTE 2)
━━━ - SCVWD ZONE BOUNDARY

ABBREVIATION

CGPS	CONTINUOUS GLOBAL POSITIONING SYSTEM
CORS	CONTINUOUSLY OPERATING REFERENCE STATION
NGS	NATIONAL GEODETIC SURVEY
SCVWD	SANTA CLARA VALLEY WATER DISTRICT
SOPAC	SCRIPPS ORBIT AND PERMANENT ARRAY CENTER

SHEET INDEX

1. COVER SHEET - VICINITY MAP
2. GPS NETWORK ADJUSTMENT REPORT
3. NGS / SCVWD MONUMENT TABLE
4. ZONE W2 OVERVIEW
5. ZONE W2 DETAIL 2A-2Z
6. ZONE W2 EXCEPTION AREA 1-2
7. ZONE W2 EXCEPTION AREA 3-8
8. ZONE W2 EXCEPTION AREA 9
9. ZONE W2 LINE TABLE (1-584)
10. ZONE W2 LINE TABLE (585-1168)
11. ZONE W2 LINE TABLE (1169-1752)
12. ZONE W2 LINE TABLE (1753-2251)
13. ZONE W5 OVERVIEW, DETAIL 5A-5Q
14. ZONE W5 DETAIL 5R,5S & EXCEPTION AREA 1-5
15. ZONE W5 LINE TABLE (1-576)
16. ZONE W5 LINE TABLE (577-1152)
17. ZONE W5 LINE TABLE (1153-1279)
18. ZONE W7 OVERVIEW, DETAIL 7A-7L
19. ZONE W7 LINE TABLE (1-342)
20. ZONE W8 OVERVIEW, DETAIL 8A-8G
21. ZONE W8 LINE TABLE (1-280)

Book 938
Pgs: 3-23

STATEMENT OF PURPOSE

THE PURPOSE OF THIS SURVEY IS TO ESTABLISH HORIZONTAL CONTROL POINTS THROUGHOUT THE GROUNDWATER BENEFIT ZONES OF SANTA CLARA VALLEY WATER DISTRICT (SCVWD), IN THE COUNTY OF SANTA CLARA, USING EXISTING NGS & SCVWD MONUMENTS CONSTRAINING TO CORS/CGPS STATIONS BASED ON THE NORTH AMERICAN DATUM OF 1983 (CSRC) 2017.50 EPOCH.

THE LIMITS OF THE GROUNDWATER BENEFIT ZONES WERE ACCEPTED DURING THE SANTA CLARA VALLEY WATER DISTRICT BOARD OF DIRECTORS MEETING DATED APRIL 28, 2020. INFORMATION FOR THIS MEETING CONTAINS METES AND BOUNDS DESCRIPTIONS OF THE AREAS INCLUDED AS PART OF THE BENEFIT ZONES, AND EXCEPTION AREAS WHICH ARE NOT PART OF THE BENEFIT ZONES.

BASIS OF BEARINGS

BEARINGS, COORDINATES, AND DISTANCES SHOWN HEREON ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM OF 1983, ZONE III, NORTH AMERICAN DATUM OF 1983 (CSRC) EPOCH 2017.50. DISTANCES SHOWN HEREON, ARE GRID DISTANCES UNLESS OTHERWISE NOTED.

ZONE W2 & W7:

GROUND DISTANCES MAY BE OBTAINED BY MULTIPLYING BY A COMBINATION FACTOR OF 1.000037821 CALCULATED AT NGS MONUMENT "QQ 453" (PID HS2787).

ZONE W5 & W8:

GROUND DISTANCES MAY BE OBTAINED BY MULTIPLYING BY A COMBINATION FACTOR OF 0.99998858 CALCULATED AT NGS MONUMENT "C 1193" (PID GU2195).

RECORD OF SURVEY

****

OF THE SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W2, W5, W7, W8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: AS NOTED FEBRUARY, 2020

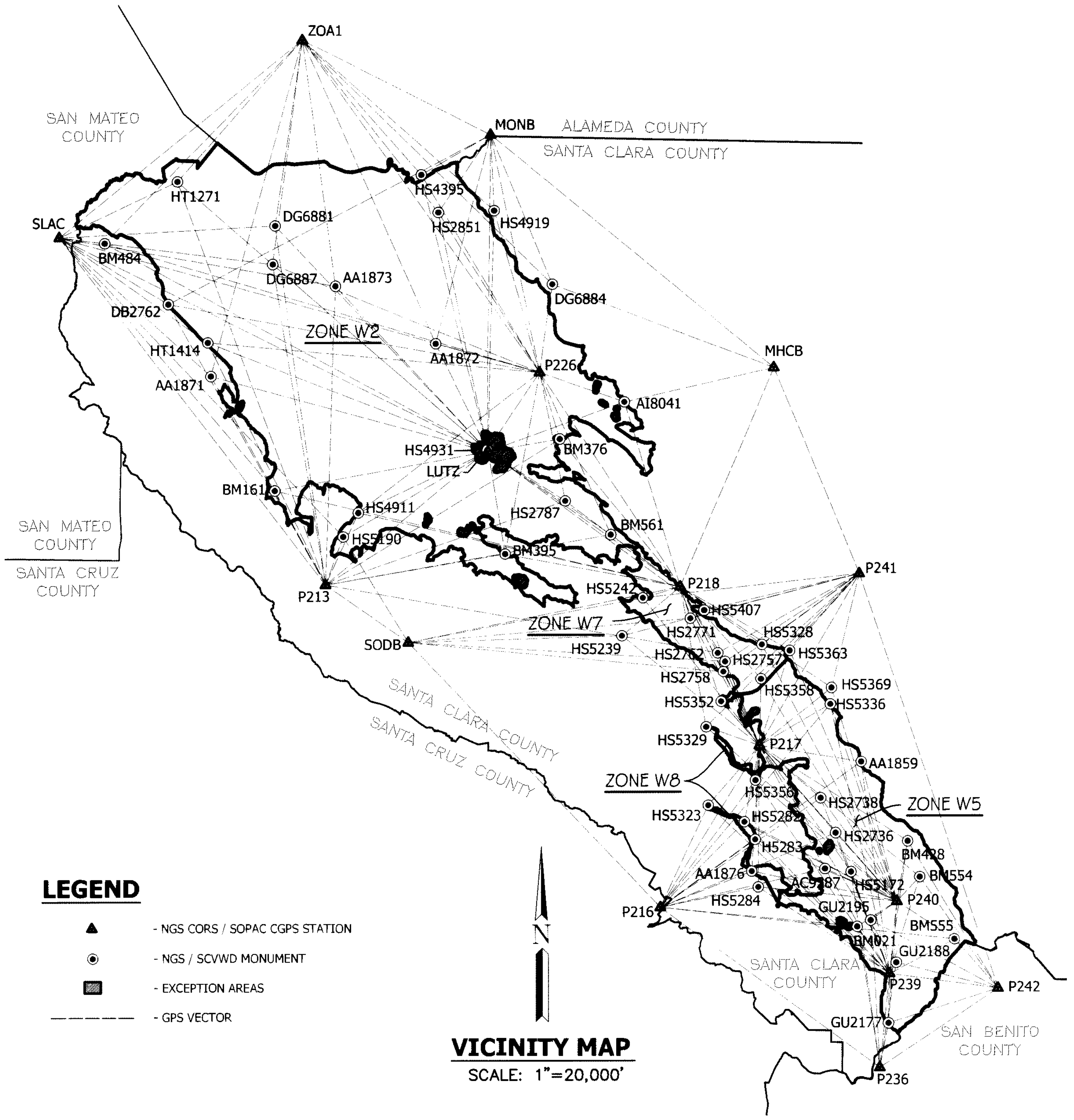
BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 1 OF 21

#24948411

#3.



VICINITY MAP

SCALE: 1"=20,000'

NETWORK ADJUSTMENT OVERVIEW

THE NETWORK ADJUSTMENT OF THIS SURVEY PROVIDES THE FRAMEWORK FOR SUPPORTING THE GENERAL ACTIVITIES OF THE SANTA CLARA VALLEY WATER DISTRICT GROUNDWATER BENEFIT ZONES. THIS NETWORK ADJUSTMENT CONSIST OF A TOTAL OF 16 CGPS (CORS & SOPAC STATIONS) AND 54 PASSIVE MONUMENTS (NGS AND SCVWD).

RECORD REFERENCES

(1) CALIFORNIA SPATIAL REFERENCE CENTER

(2) FOUND NGS MONUMENT AS DESCRIBED IN NGS DATASHEET

(3) FOUND SCVWD BENCHMARK AS DESCRIBED IN VERTICAL DATABASE REPORT

CGPS / CORS CONTROL STATIONS

Point ID	Northing	Easting	*Latitude*	*Longitude*	Ellipsoidal Height	Description (Site Name)
LUTZ	**1,929,813.58**	**6,164,511.96**	***37-17-12.659850***	***121-51-54.768430***	***313.307***	SOPAC_LUTZ per (1)
MHCB*	**1,948,853.37**	**6,229,522.33**	***37-20-29.50724***	***121-38-33.23271***	***4141.442***	CORS_MT HAMILTON BARD per (1)
MONB	**2,002,078.08**	**6,165,090.65**	***37-29-07.165643***	***121-52-00.668458***	2463.496	SOPAC_MONUMENT PEAK per (1)
P213	**1,899,375.80**	**6,127,479.74**	***37-12-06.159819***	***121-59-26.966052***	***549.959***	SOPAC_LENIHANDAMCN2005 per (1)
P216	1,825,700.95	6,203,595.55	37-00-08.727223	121-43-34.301152	1107.152	SOPAC_MTMADONNA_CN2007 per (1)
P217	**1,862,583.65**	**6,226,119.80**	***37-06-16.182827***	***121-39-02.230374***	***238.976***	CORS_LACROSSEDRCN2005 per (1)
P218	**1,898,866.39**	**6,208,120.63**	***37-12-12.645222***	***121-42-50.210313***	***273.089***	SOPAC_COYOTECRK_CN2005 per (1)
P226	**1,947,823.40**	**6,176,300.60**	***37-20-12.385669***	***121-49-32.061069***	***18.344***	SOPAC_REIDHILLVWCN2006 per (1)
P236	**1,789,090.31**	**6,253,340.00**	***36-54-12.755154***	***121-33-16.012635***	***186.037***	SOPAC_LOMERIAS_CN2005 per (1)
P239	**1,810,519.08**	**6,255,531.56**	***36-57-44.856268***	***121-32-51.986749***	***62.508***	SOPAC_UVASCRK_CN2008 per (1)
P240	**1,827,009.51**	**6,257,396.46**	***37-00-28.097252***	***121-32-31.272883***	***86.238***	SOPAC_MILLERSLGHCN2005 per (1)
P241*	**1,901,826.06**	**6,248,844.59**	***37-12-46.82867***	***121-34-27.28534***	***2738.753***	SOPAC_RODEOFLAT_CN2007 per (1)
P242	**1,807,147.72**	**6,280,217.95**	***36-57-14.147085***	***121-27-47.412947***	***50.154***	SOPAC_FRAZIERAIRCN2004 per (1)
SLAC	**1,978,635.08**	**6,066,752.06**	***37-24-59.457424***	***122-12-15.302399***	***210.656***	CORS_SLAC_BARD_CN2002 per (1)
SODB	**1,886,225.30**	**6,146,305.30**	***37-09-59.052335***	***121-55-31.825104***	***3235.148***	SOPAC_SODA SPRINGS-BARD STATION per (1)
ZOA1	**2,023,760.69**	**6,122,180.77**	***37-32-34.985867***	***122-00-57.358294***	***-11.241***	CORS_OAKLAND 1 per (1)

Items that are BOLD were constraining elements in the final adjustment per (1)

* TRANSFORMED POSITIONS BETWEEN EPOCH 2019.93 TO 2017.50 (NGS HTDP SITE)

Book 938

Pgs: 4-23

RECORD OF SURVEY

****

OF THE SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W2, W5, W7, W8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: AS NOTED FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 2 OF 21

#4.

NGS / SCVWD MONUMENTS

Point ID	Northing	Easting	COH 88 Elevation	Description
AA1859	1858857.983	6249254.345	385.34	"HPGN D CA NEW" 2-inch alum. Disc, stamped "NEW HPGN-D 1992" per (2)
AA1871	1947026.356	6101391.703	435.30	"HPGN D CA SAN ANTONIO" 2.5-inch alum. disc, stamped "HPGN D SAN ANTONIO 1992" per (2)
AA1872	1954404.579	6152723.928	60.49	"HPGN D CA SAN PEDRO" 2.5-inch alum. disc, stamped "HPGN D SAN PEDRO 1992" per (2)
AA1873	1967518.595	6129780.896	25.98	"HPGN D CA MISSION" 2.5-inch alum. disc, stamped "COUNTY OF SANTA CLARA HPGN D MISSION 1992" per (2)
AA1876	1833888.525	6224355.707	299.21	"HPGN D CA ADAMS RESET" 2.5-inch alum. disc, stamped "HPGN D ADAMS RESET 1992" per (2)
AC9287	1834452.167	6241030.766	222.28	"G 812 RESET" 3.5-inch alum. Disc, stamped "G 815 RESET 1993" per (2)
AI8041	1941052.844	6195424.916	487.34	"T 1474" steel rod in mon. well per (2)
BM021	1821222.897	6248358.527	222.69	"SCVWD BM021" 2-inch brass disc, stamped "SCVWD BM 021" per (3)
BM161	1920877.225	6115896.546	455.25	"SCVWD BM161" 2-inch brass disc, stamped "SCVWD BM 161" per (3)
BM376	1932624.735	6180788.354	164.65	"SCVWD BM376" 2-inch brass disc, stamped "SCVWD BM 376" per (3)
BM395	1906387.231	6168363.636	256.47	"SCVWD BM395" 2-inch brass disc, no stamped per (3)
BM428	1840731.268	6259815.144	310.91	"SCVWD BM0428" 2-inch alum. disc, stamped "SANTA CLARA VALLEY WATER DISTRICT BENCHMARK" per (3)
BM484	1977344.942	6077103.101	200.84	"SCVWD BM484" 2-inch brass disc, stamped "SANTA CLARA VALLEY WATER DISTRICT BENCHMARK 484 2006" per (3)
BM554	1832563.994	6262569.655	207.86	"SCVWD BM554" 2-inch brass disc, stamped "SANTA CLARA VALLEY WATER DISTRICT BENCHMARK 554 2008" per (3)
BM555	1818353.827	6270357.709	148.05	"SCVWD BM555" 2-inch brass disc, stamped "US DEPARTMENT OF THE INTERIOR BM" per (3)
BM561	1910782.03	6192316.66	222.32	"SCVWD BM561" 2-inch brass disc, stamped "SCVWD BM561 RESET 2001" per (3)
DB2762	1963426.675	6091663.017	208.91	"ALTOS RESET RM 3" 3-inch brass disc, stamped "ALTOS 1957 NO. 3 1972" per (2)
DG6881	1981336.483	6115993.028	4.24	"ARC 34" 3.5-inch brass disc, stamped "ARC 34" per (2)
DG6884	1967896.285	6179117.179	548.51	"CROTHERS" 2-inch brass disc, stamped "COUNTY OF 5ANTA CLARA ROAD COMM" per (2)
DG6887	1972516.678	6115439.352	36.02	"LOCKHEED" 3-inch brass disc, stamped "SCVWD BM 483 LOCKHEED" per (2) & (3)
GU2177	1799234.949	6255276.662	147.07	"S 149" 3-inch brass disc, stamped "US COAST & GEODETIC SURVEY BENCHMARK S149 1933" per (2)
GU2188	1813060.682	6257039.278	179.72	"R 149" 2-inch brass disc, stamped "US COAST & GEODETIC SURVEY BENCHMARK R149 1933" per (2)
GU2195	1822679.971	6251434.415	190.92	"C 1193" 3-inch alum disc, stamped US COAST & GEODETIC SURVEY BENCHMARK C1193 1968" per (2)
HS2736	1842628.423	6243436.35	236.43	"M 149" 2.5-inch brass disc, stamped "US COAST & GEODETIC SURVEY BENCHMARK M149 1933" per (2)
HS2738	1850570.685	6240040.243	266.79	"G 1080" 3-inch brass disc, stamped "US COAST & GEODETIC 5URVEY BENCHMARK G1080 1967" per (2)
HS2757	1881802.891	6218243.406	340.25	"A 177" 3.5-inch alum disc, stamped "US COAST & GEODETIC SURVEY BENCHMARK A177 1934" per (2)
HS2758	1879455.712	6217851.736	348.39	A 1077 X 2.5-inch alum disc, stamped "US COAST & GEODETIC SURVEY BENCHMARK A1077X 1967" per (2)
HS2762	1883761.226	6216603.903	335.57	"J 453" 2.5-inch brass disc, stamped "US COAST & GEODETIC SURVEY BENCHMARK J453 1954" per (2)
HS2771	1891660.464	6210401.441	303.03	"PERRYS RM 4" 2.5-inch brass disc, stamped "US COAST & GEODETIC SURVEY BENCHMARK PERRYS NO.4 1946" per (2)
HS2787	1918486.923	6182012.532	190.66	"QQ 453" 3-inch brass disc, stamped "US COAST & GEODETIC SURVEY BENCHMARK QQ453 1954" per (2)
HS2851	1984338.441	6153197.567	15.77	"M 874" 3.5-inch brass disc, stamped "US COAST & GEODETIC SURVEY M874 1954" per (2)
HS4395	1992944.446	6149256.915	16.10	"C 1371" 3.5-inch alum disc, stamped "NATIONAL GEODETIC SURVEY VERTICAL CONTROL MARK C1371 1983" per (2)
HS4911	1915822.693	6134903.611	307.52	"VASONA" 2.5-inch brass disc, stamped "VASONA 1972" per (2)
HS4919	1984757.819	6165893.943	584.14	"COCHES" 3.5-inch aluminum disc, stamped "US COAST & GEODETIC SURVEY TRIANGULATION STATION COCHES 1958" per (2)
HS4931	1930119.034	6164312.712	437.17	"AMERICAN RESET" 2-inch brass disc, stamped "AMERICAN 1947 1973" per (2)
HS5172	1833730.547	6246961.773	208.78	"Q 1448" steel rod in mon. well per (2)
HS5190	1910355.23	6131486.674	370.32	"J 1456" steel rod in mon. well per (2)
HS5239	1887693.872	6194817.555	515.54	"HJH 51" 4-inch brass disc, stamped "US GEOLOCICAL SURVEY BENCHMARK HJH 51 1948" per (2)
HS5242	1896341.001	6199576.297	254.92	"X 1457" steel rod in mon. well per (2)
HS5282	1845160.566	6222675.208	385.84	"T 1458" steel rod in mon. well per (2)
HS5283	1841145.245	6225144.308	337.92	"110 JD" 4-inch brass disc, stamped "NATIONAL GEODETIC SURVEY VERTICAL CONTROL MARK 110JD 2001" per (2)
HS5284	1830297.858	6225858.926	325.17	"U 1458" steel rod in mon. well per (2)
HS5323	1848959.498	6214444.818	503.28	"C 030" 2.5-inch brass disc, stamped "SANTA CLARA VALLEY WATER DISTRICT" per (2)
HS5328	1885648.65	6226668.995	388.48	"M 099" 1-inch iron pipe w/ yellow plug per (2)
HS5329	1866847.196	6213989.783	462.39	"M 103" 3/4-inch iron pipe open per (2)
HS5336	1871995.365	6242206.892	443.84	"M 174" 3/4-inch iron pipe open per (2)
HS5352	1872650.928	6217366.811	416.59	"M 351" 2-inch brass disc, no stamp per (2)
HS5356	1854669.641	6225179.044	373.76	"M 355" 3/4-inch iron pipe w/ yellow plug per (2)
HS5358	1877756.27	6226429.274	370.99	"M 357" railroad spike flushed per (2)
HS5363	1884274.447	6233024.816	647.27	"M 362" railroad spike per (2)
HS5369	1875725.202	6242469.606	879.48	"M 368" 2-inch brass disc, no stamp per (2)
HS5407	1893492.285	6213542.84	338.31	"HPGN CA 04 03" 2.5-inch aluminum disc, stamped "CALIF DEPT OF TRANSPORTATION HPGN STA 04-03 1990" per (2)
HT1271	1991436.02	6093693.811	7.31	"941 4537 TIDAL 4 RESET" 3.5-inch bass disc, stamped "TIDAL 4 RESET 1970" per (2)
HT1414	1954694.297	6100718.558	237.50	"J 884" 2-inch brass disc, stamped "SANTA CLARA VALLEY WATER DISTRICT 1016R" per (2)

PROJECT COORDINATES REPORT:

DATE OF SURVEY:	DECEMBER 19, 2019 – JANUARY 21, 2020
HORIZONTAL DATUM:	NORTH AMERICAN DATUM 1983 (CSRC), EPOCH 2017.50
VERTICAL DATUM:	CALIFORNIA ORTHOMETRIC HEIGHT 1988 (COH88)
COORDINATE SYSTEM:	CALIFORNIA COORDINATE SYSTEM ZONE 3

NOTES:

1. SEE SHEET 1 FOR STATEMENT OF PURPOSE, SHEET INDEX.
2. SEE SHEET 2 FOR VICINITY MAP.

RECORD REFERENCES

(1) CALIFORNIA SPATIAL REFERENCE CENTER

(2) FOUND NGS MONUMENT AS DESCRIBED IN NGS DATASHEET

(3) FOUND SCVWD BENCHMARK AS DESCRIBED IN VERTICAL DATABASE REPORT

Book
938
Pgs:
5-23

RECORD OF SURVEY

****

OF THE SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W2, W5, W7, W8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: AS NOTED FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

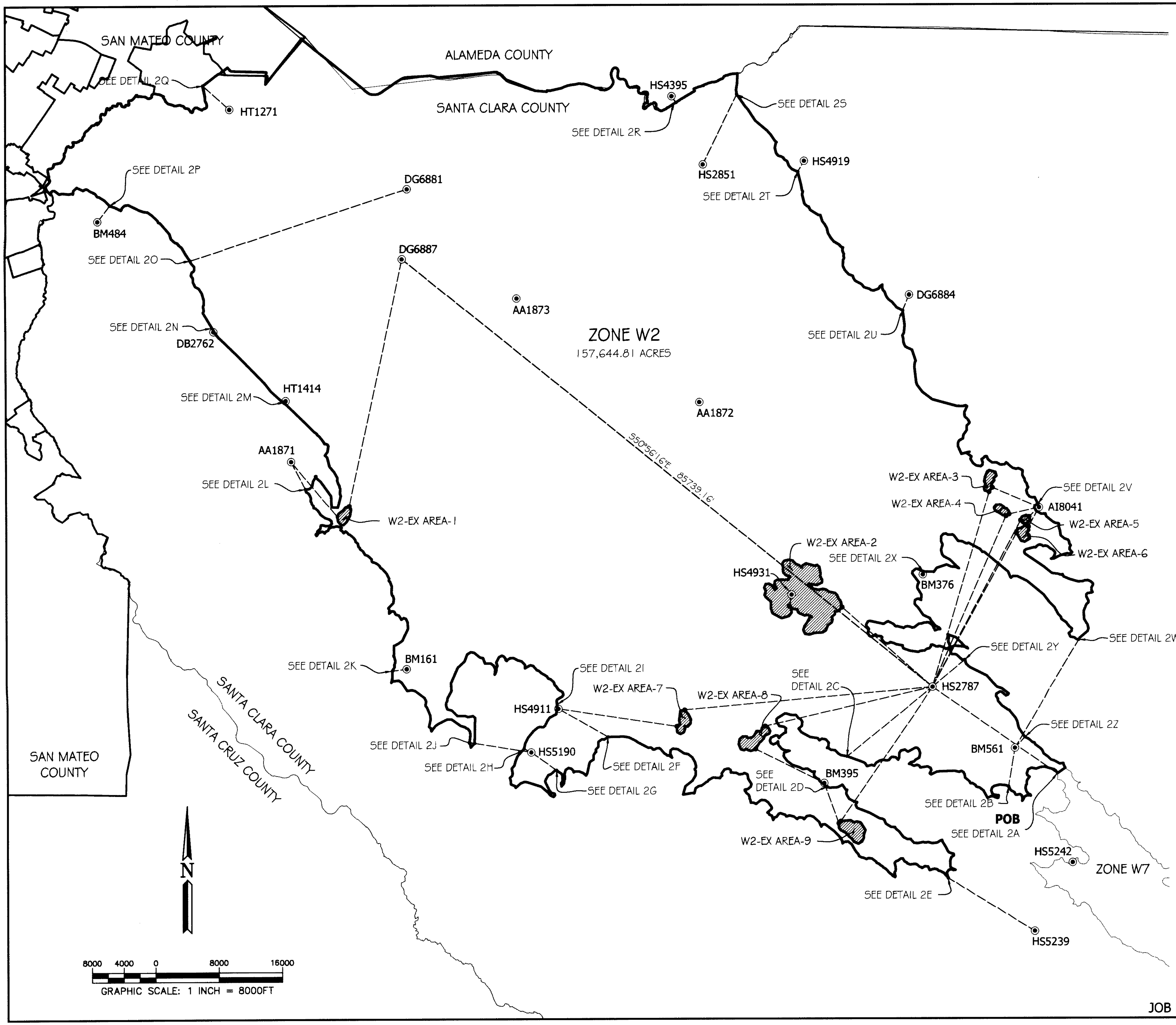
JOB NO. 16310

SHEET 3 OF 21

15.

Book 938

Pgs: 6-23



NOTE

1. LINE TABLE SHOWN ON SHEETS 9-12 REPRESENTS THE COURSES OF ZONE W2 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN HERE.
2. SEE SHEETS 5-8 FOR DETAILS 2A-2Z AND W2-EXCEPTION AREAS 1-9.

LEGEND

◉ - NGS / SCVWD MONUMENT

– – – – - GPS VECTOR (GRID TIE)

—— - SCVWD ZONE W2

▨ - EXCEPTION AREAS

RECORD OF SURVEY

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

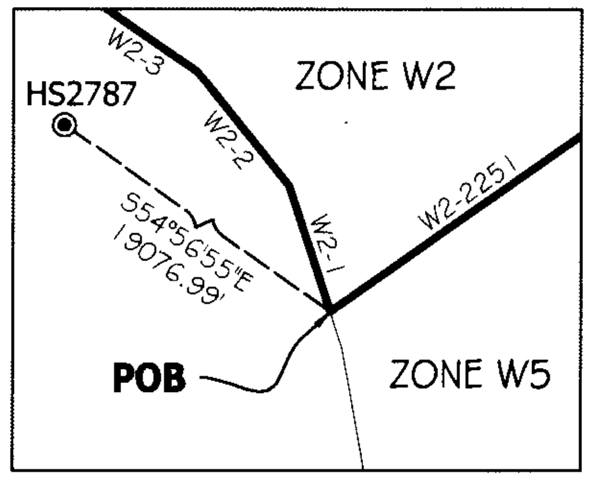
SCALE: 1"=8000' FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

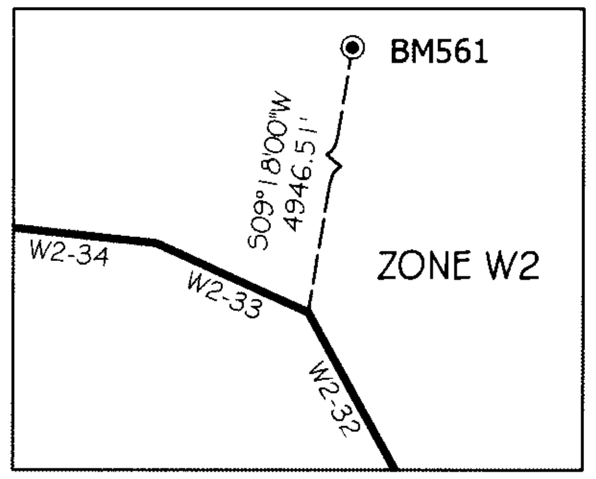
JOB NO. 16310

SHEET 4 OF 21

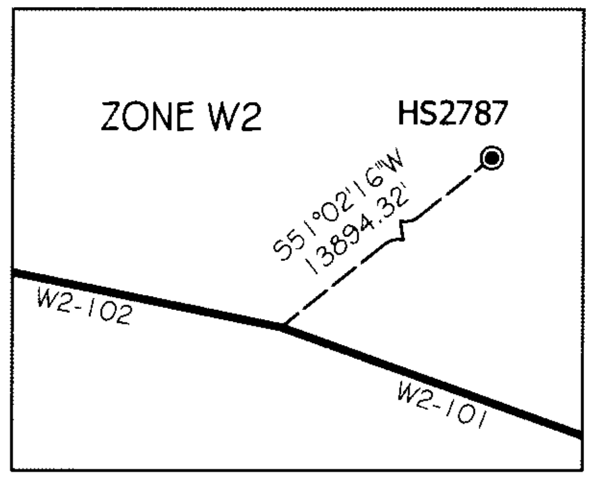
#6.



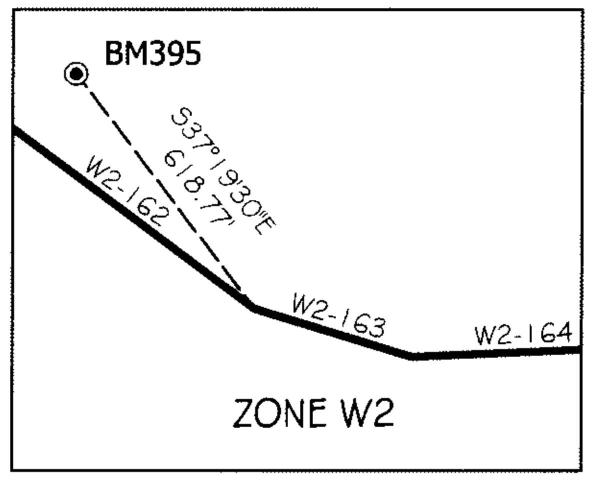
DETAIL 2A
N.T.S.



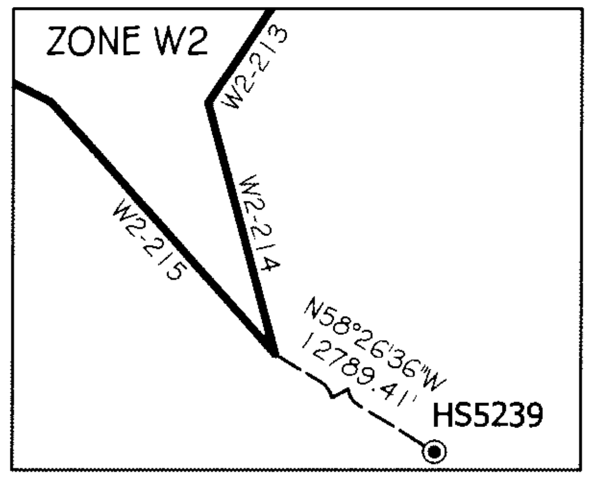
DETAIL 2B
N.T.S.



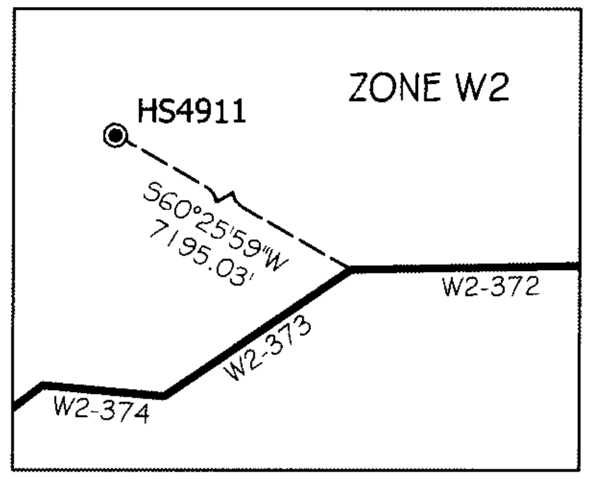
DETAIL 2C
N.T.S.



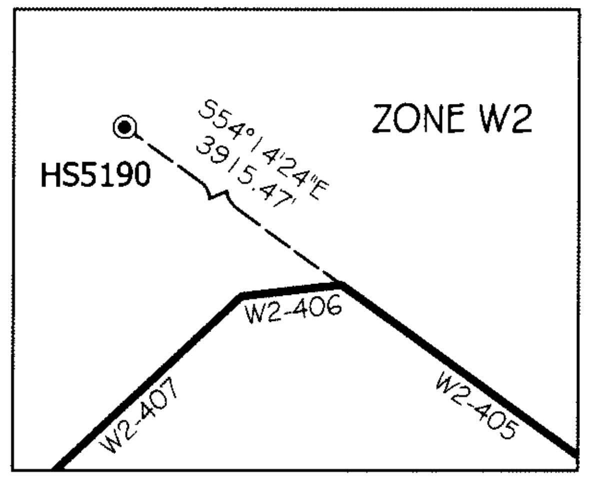
DETAIL 2D
N.T.S.



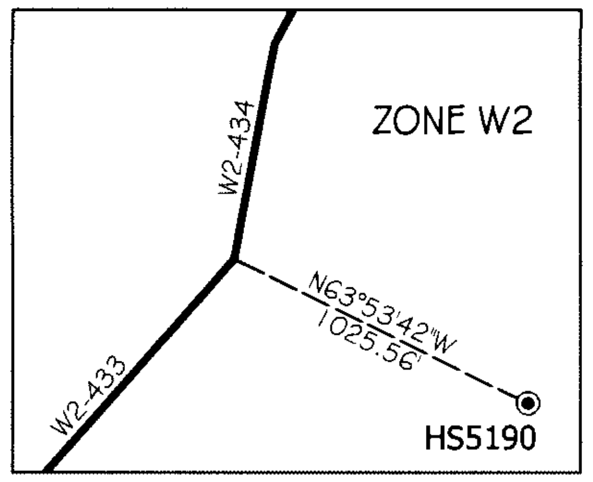
DETAIL 2E
N.T.S.



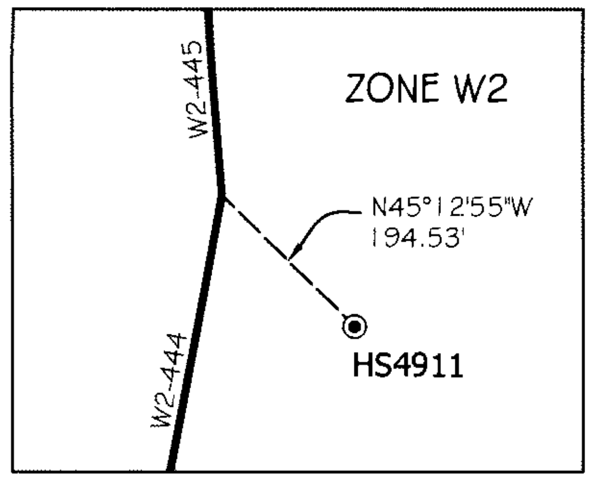
DETAIL 2F
N.T.S.



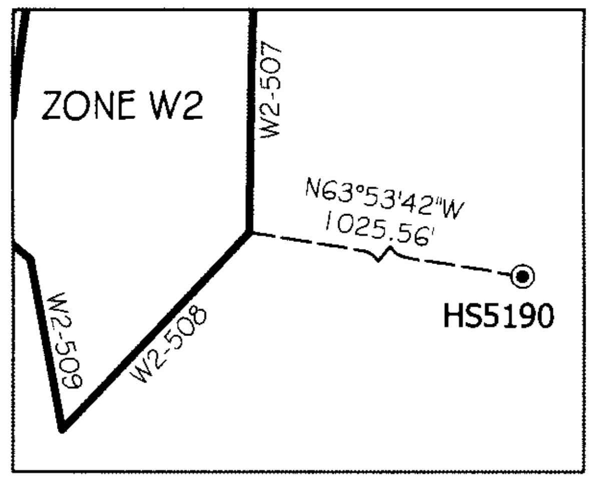
DETAIL 2G
N.T.S.



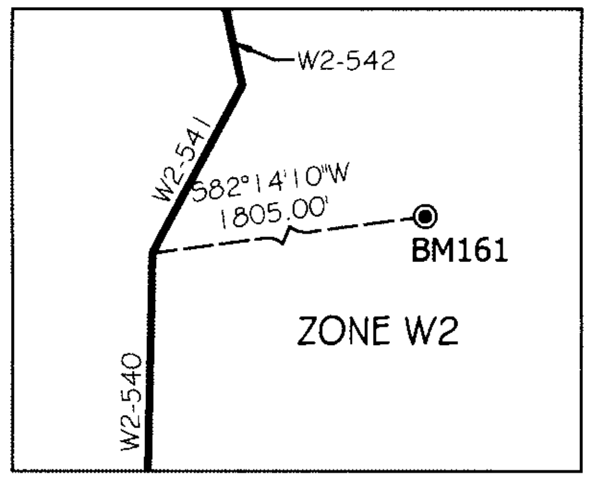
DETAIL 2H
N.T.S.



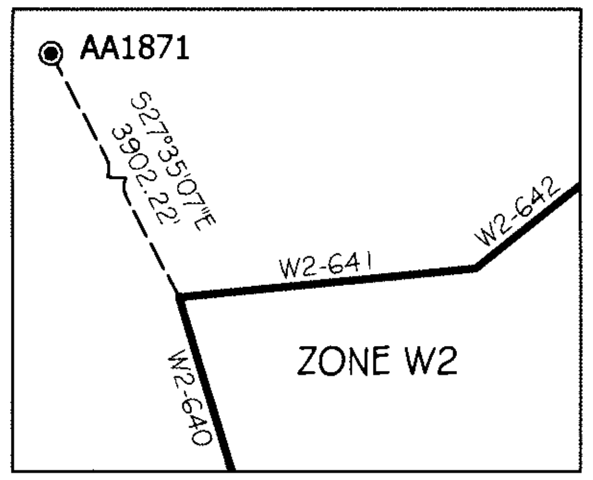
DETAIL 2I
N.T.S.



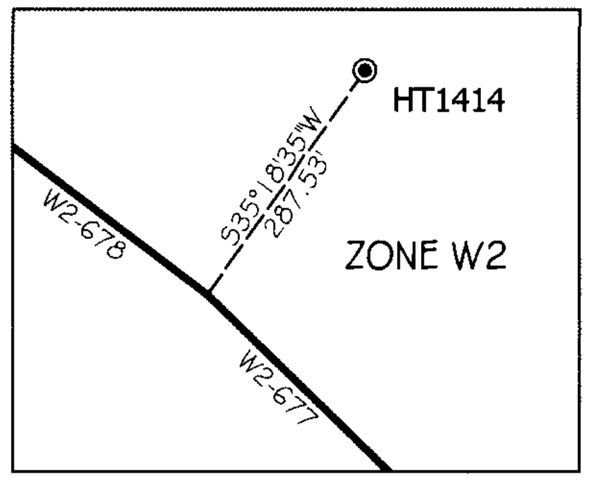
DETAIL 2J
N.T.S.



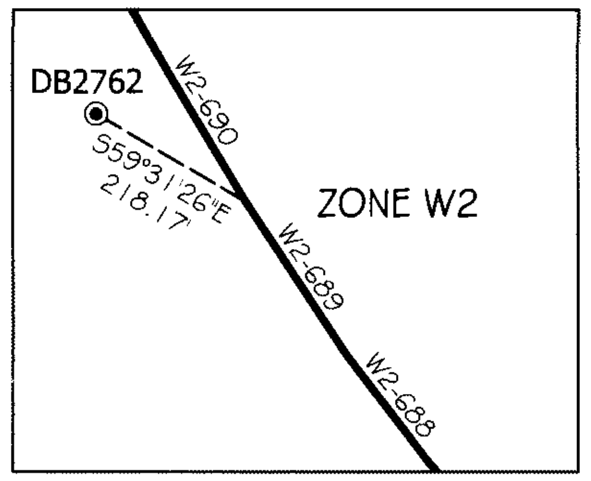
DETAIL 2K
N.T.S.



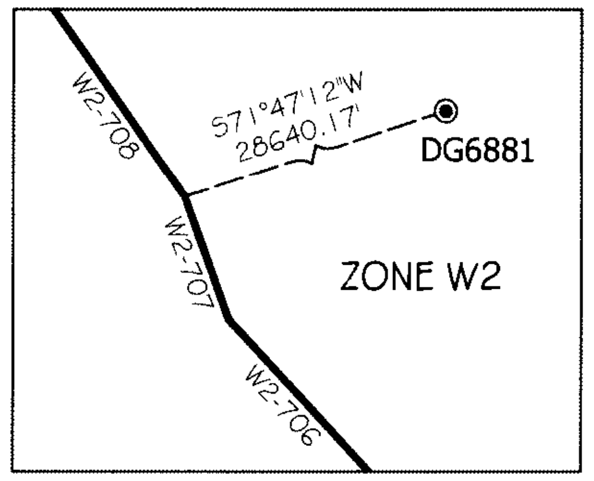
DETAIL 2L
N.T.S.



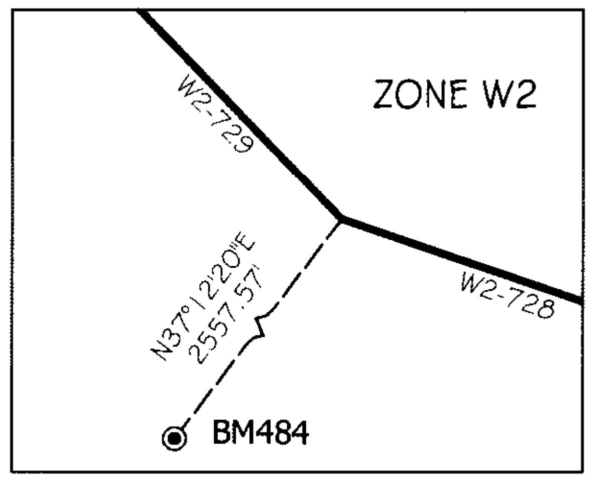
DETAIL 2M
N.T.S.



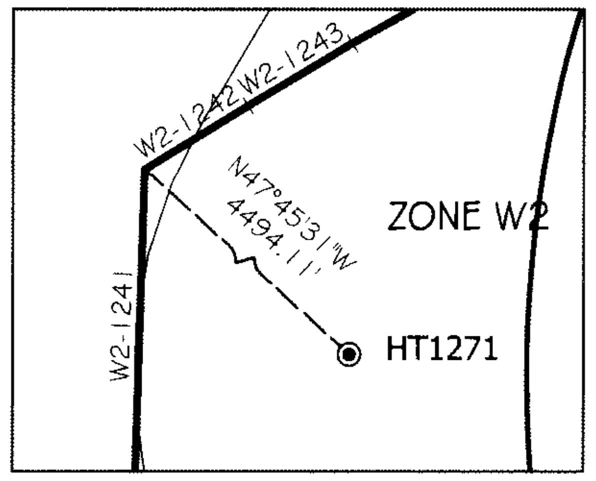
DETAIL 2N
N.T.S.



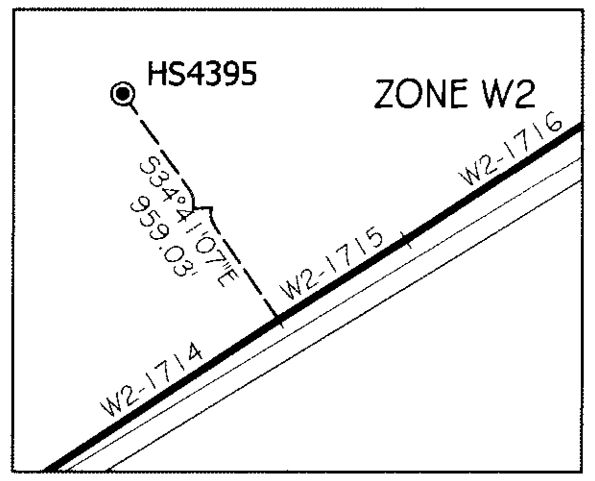
DETAIL 2O
N.T.S.



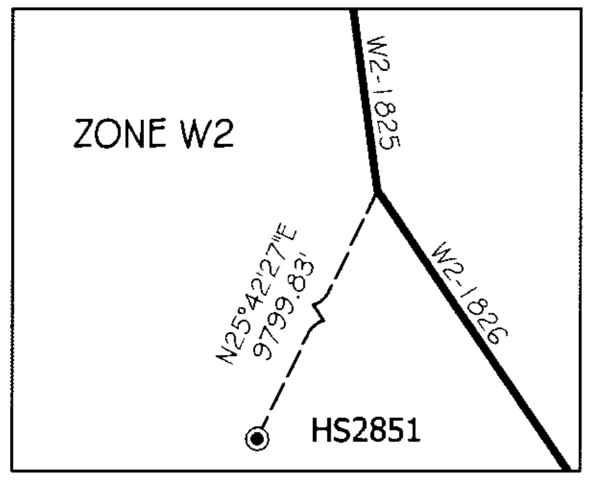
DETAIL 2P
N.T.S.



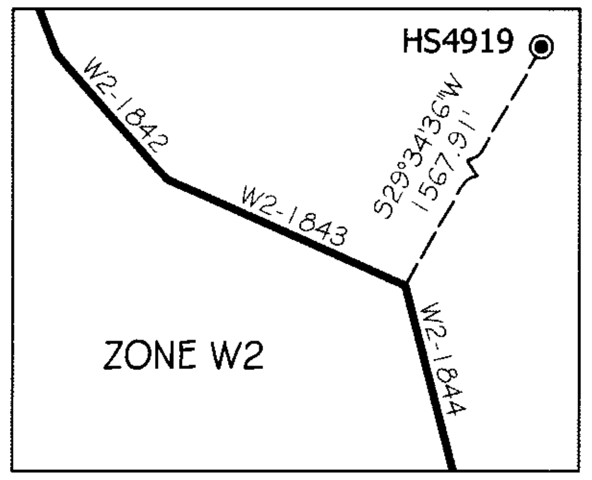
DETAIL 2Q
N.T.S.



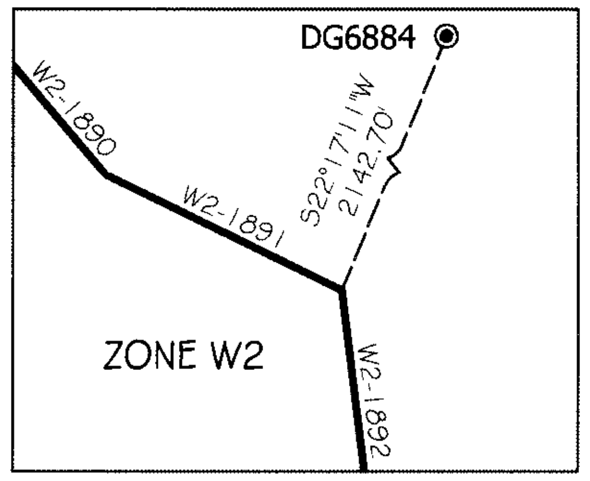
DETAIL 2R
N.T.S.



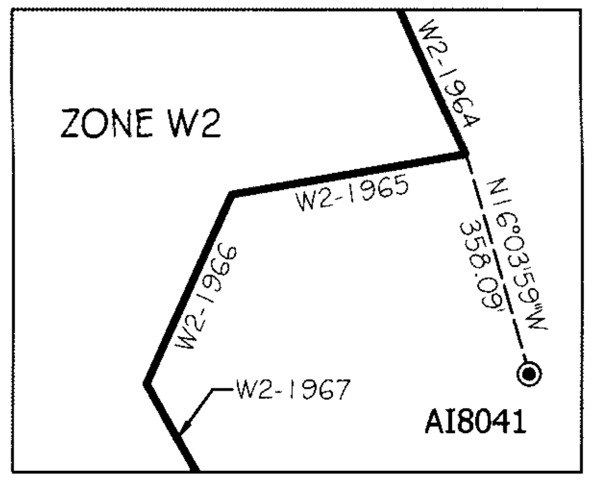
DETAIL 2S
N.T.S.



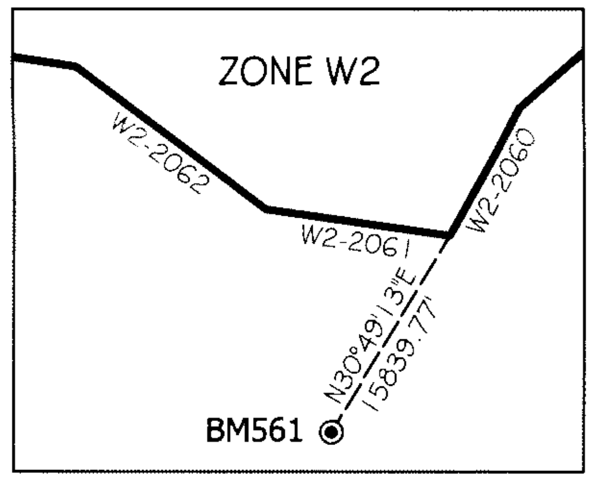
DETAIL 2T
N.T.S.



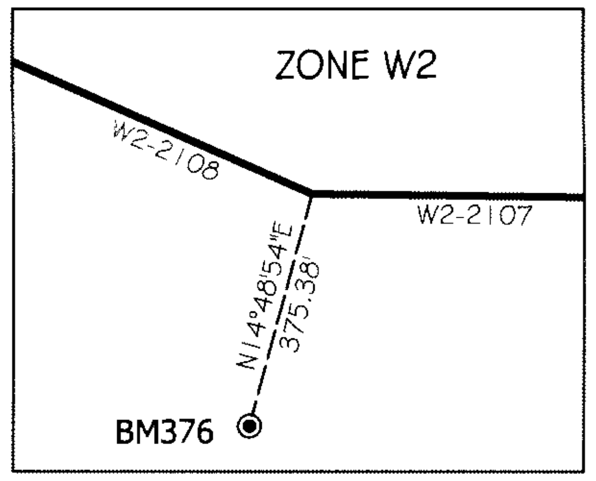
DETAIL 2U
N.T.S.



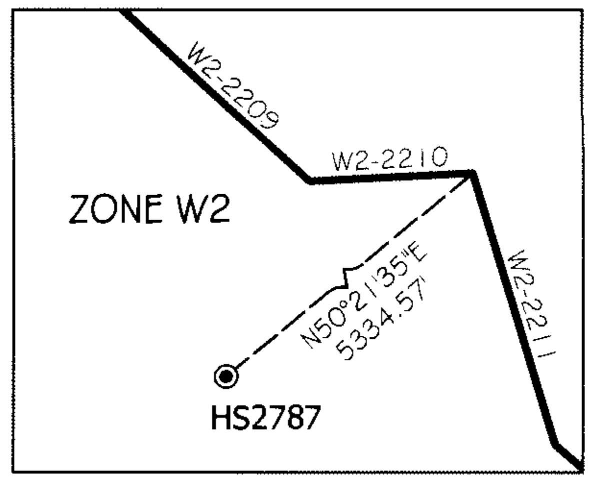
DETAIL 2V
N.T.S.



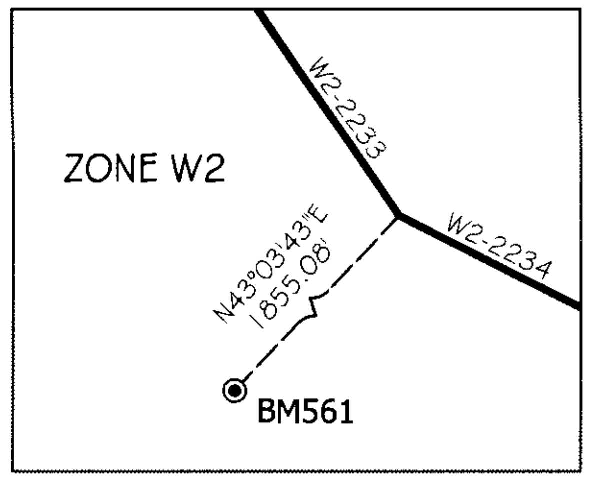
DETAIL 2W
N.T.S.



DETAIL 2X
N.T.S.



DETAIL 2Y
N.T.S.



DETAIL 2Z
N.T.S.

(ALL DETAILS SHOWN)

LEGEND

◉ - NGS / SCVWD MONUMENT
------ - GPS VECTOR (GRID TIE)
━━━ - SCVWD ZONE W2

NOTE

1. LINE TABLE SHOWN ON SHEETS 9-12 REPRESENTS THE COURSES OF ZONE W2 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN ON DETAIL 2A.
2. SEE SHEETS 5-8 FOR LOCATION ON ZONE W2 EXCEPTION AREAS 1-9.

RECORD OF SURVEY

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

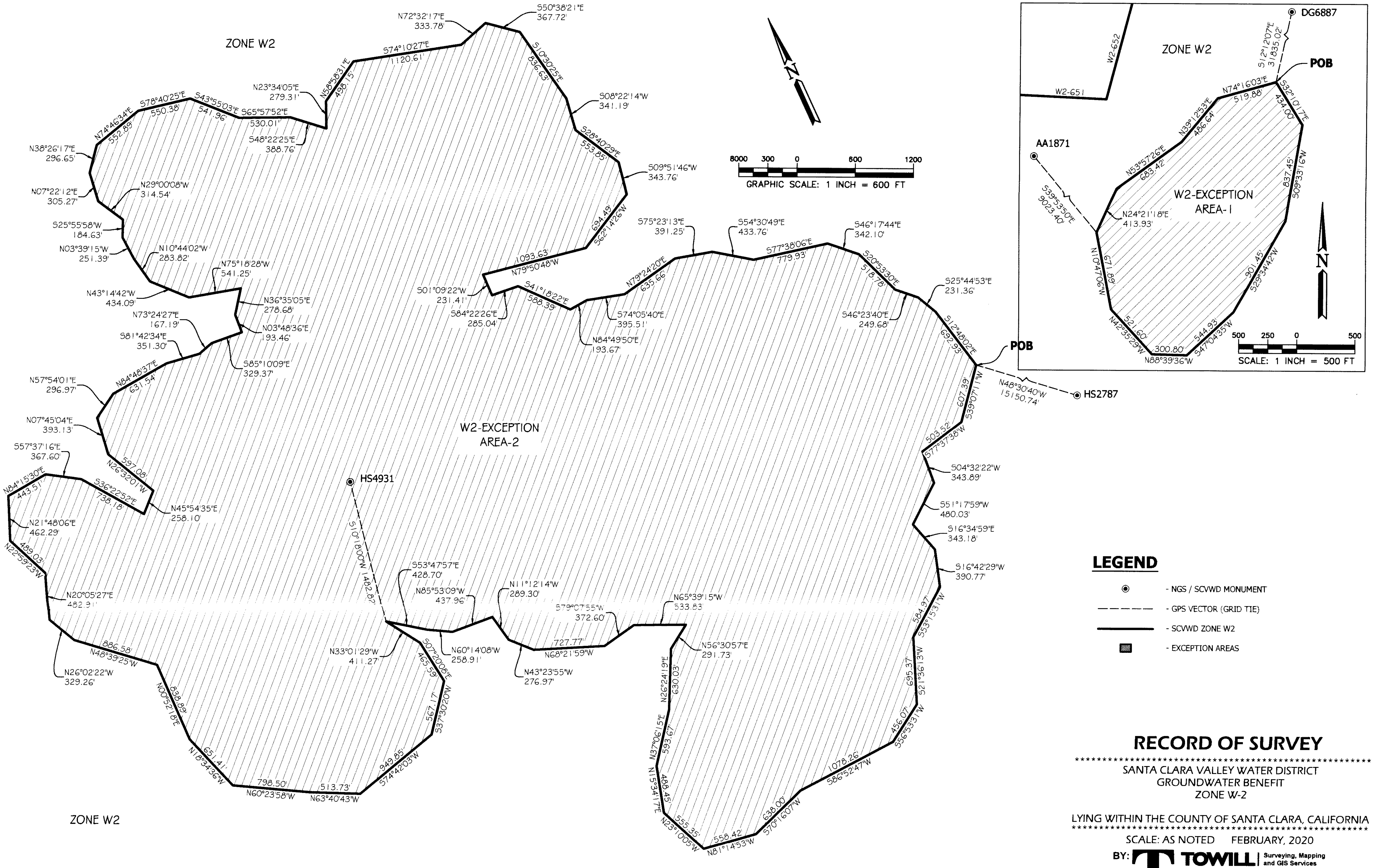
BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 5 OF 21

Book 938
Pgs: 7-23

#7.



Book 938

Pgs: 8-23

LEGEND

- ◉ - NGS / SCVWD MONUMENT
- – – – – - GPS VECTOR (GRID TIE)
- ━━━ - SCVWD ZONE W2
- ▨ - EXCEPTION AREAS

RECORD OF SURVEY

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

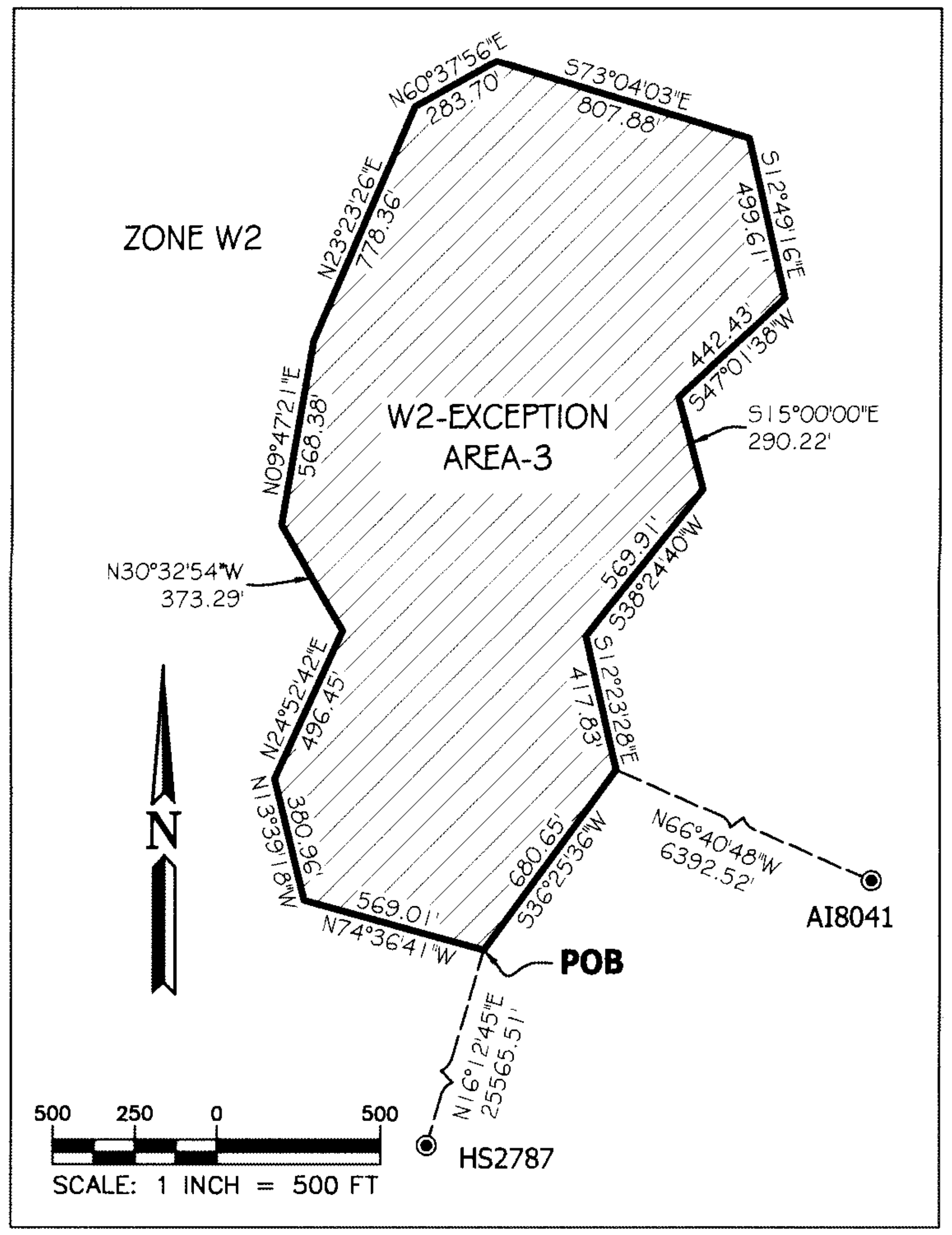
SCALE: AS NOTED FEBRUARY, 2020

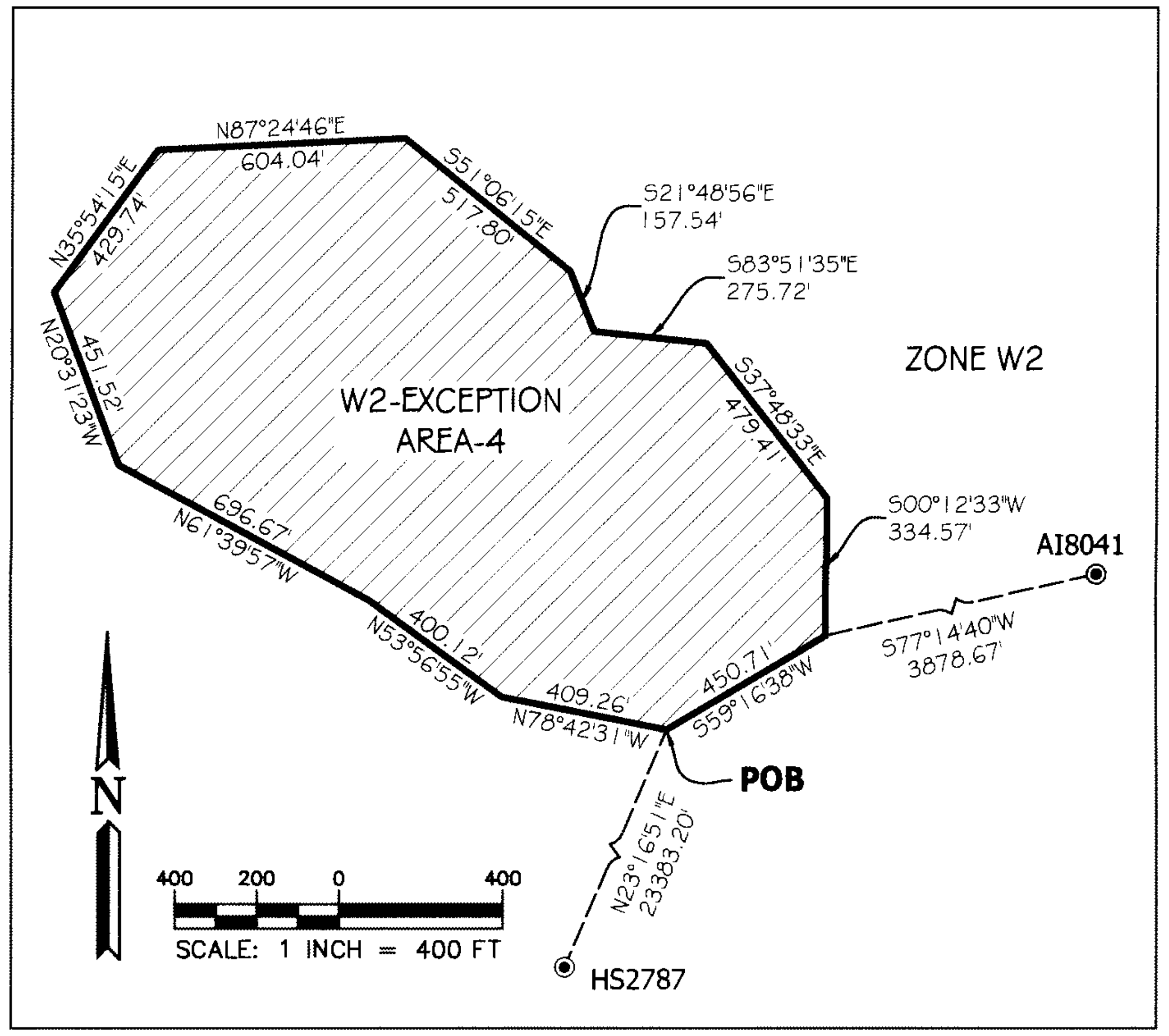
BY: TOWILL Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

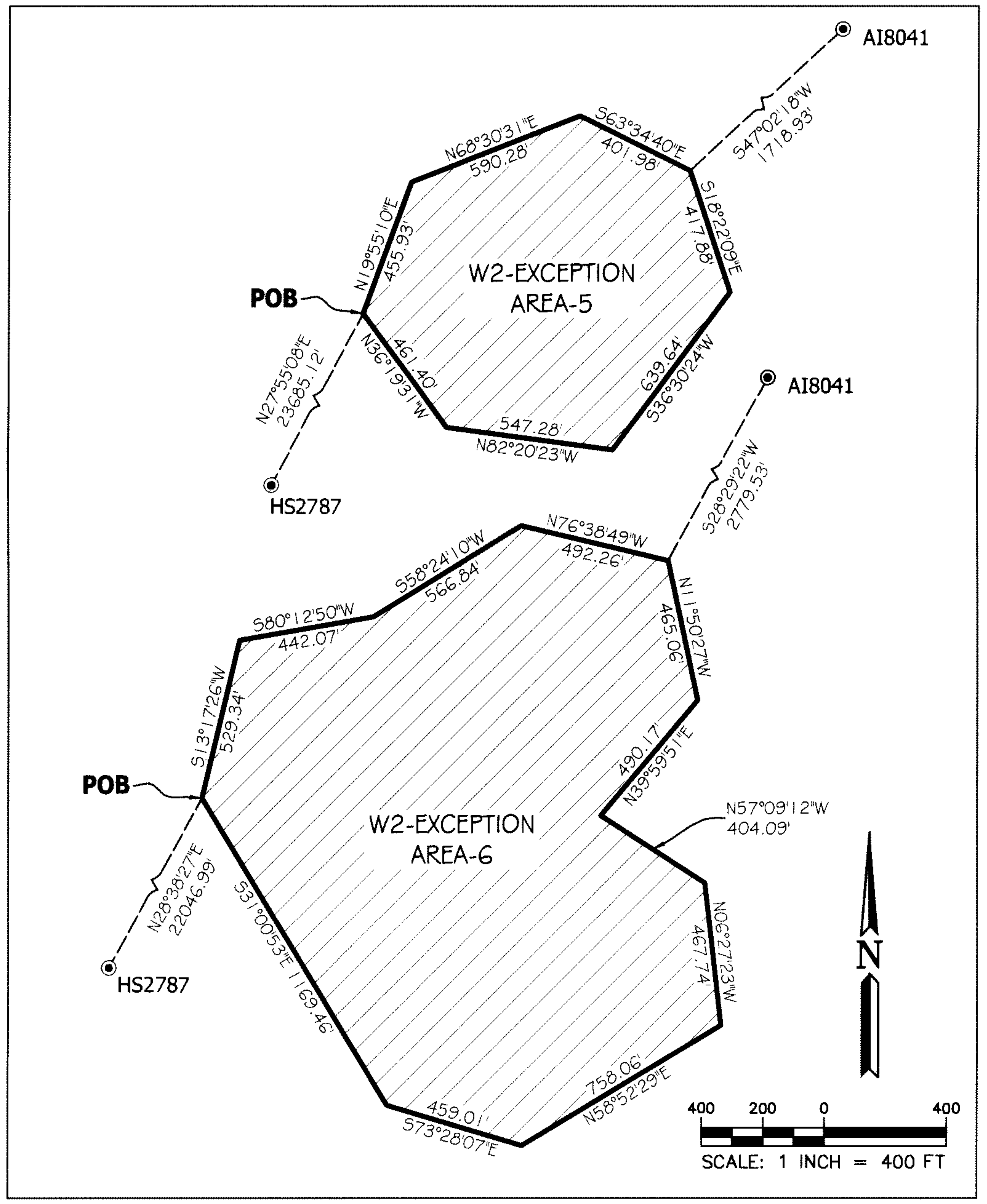
JOB NO. 16310

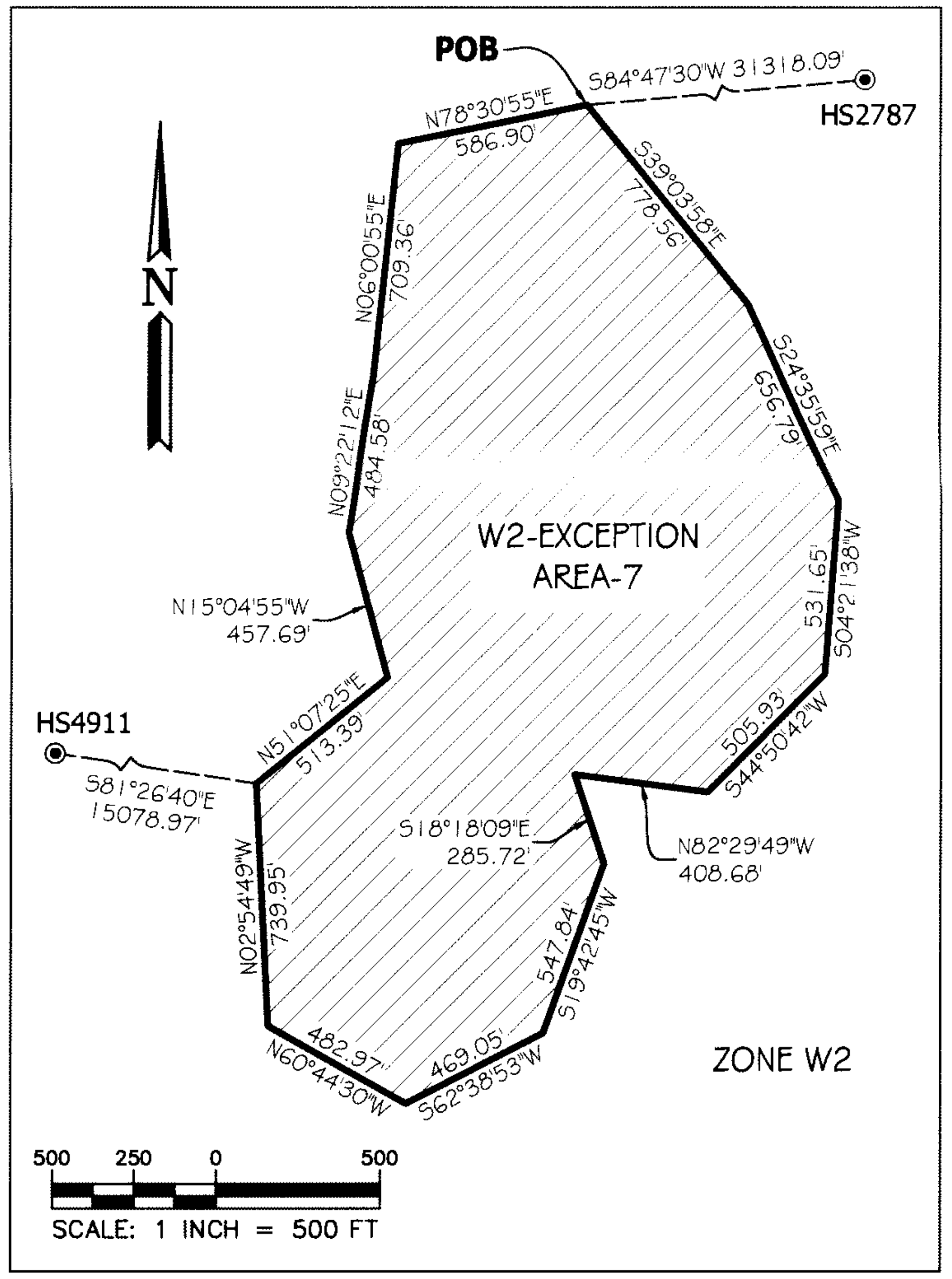
SHEET 6 OF 21

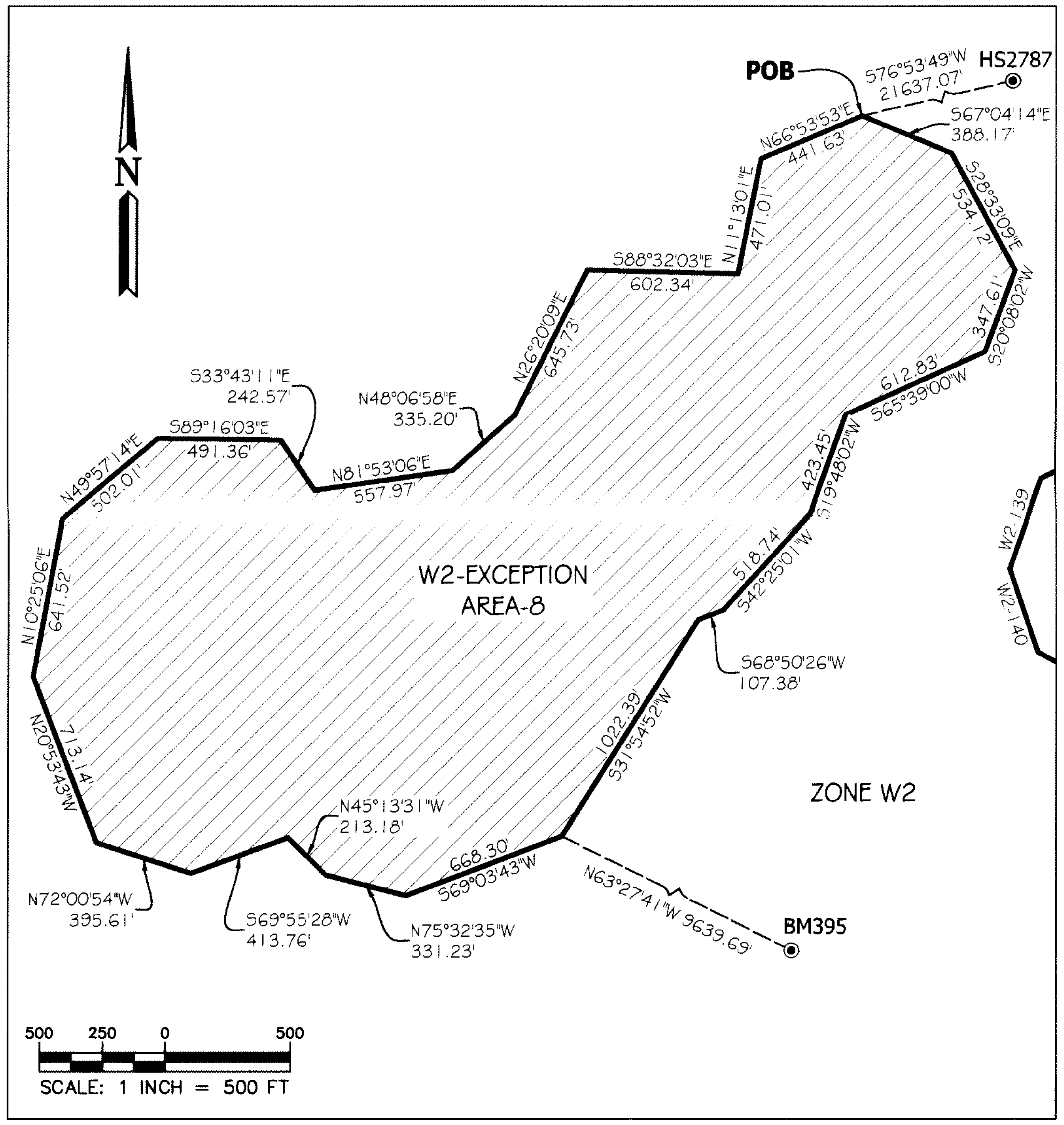
#2











LEGEND

◉	- NGS / SCVWD MONUMENT
– – – –	- GPS VECTOR (GRID TIE)
——	- SCVWD ZONE W2
▨	- EXCEPTION AREAS

RECORD OF SURVEY

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

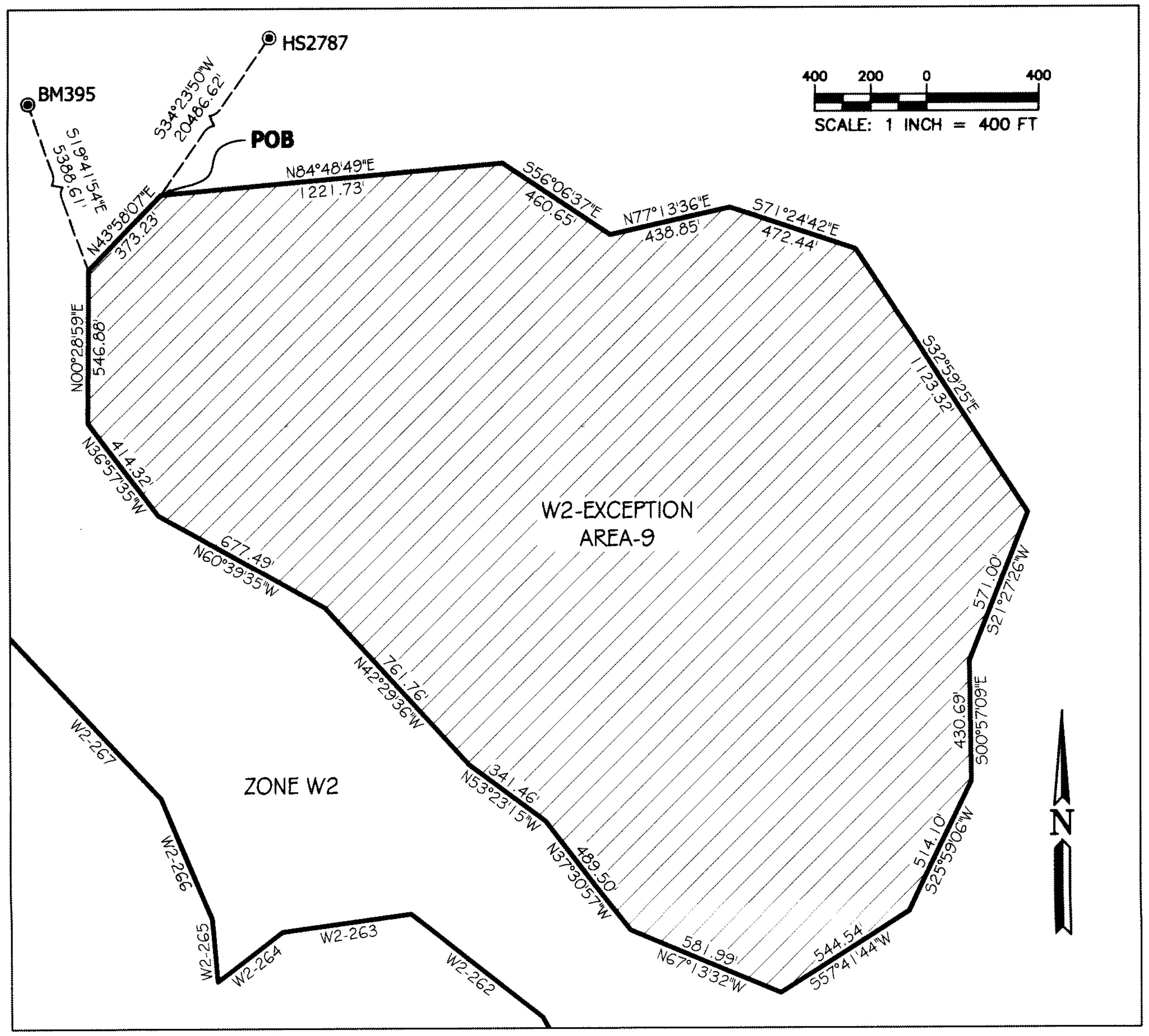
BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 7 OF 21

Book 938
Pgs: 9-23

#9.



Book
938

Pgs:
10-23

LEGEND

◉	- NGS / SCVWD MONUMENT
— — — — —	- GPS VECTOR (GRID TIE)
━━━━━	- SCVWD ZONE W2
▨	- EXCEPTION AREAS

RECORD OF SURVEY

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310 SHEET 8 OF 21

#10.

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1	N18°16'06"W	207.72'
W2-2	N38°34'15"W	230.57'
W2-3	N55°49'22"W	194.60'
W2-4	N73°58'22"W	1248.42'
W2-5	S85°40'12"W	531.45'
W2-6	S71°02'34"W	595.55'
W2-7	N79°33'50"W	601.94'
W2-8	S64°34'19"W	431.47'
W2-9	S18°43'39"W	520.35'
W2-10	S10°51'49"E	246.26'
W2-11	S54°59'13"E	363.47'
W2-12	S36°04'25"W	481.71'
W2-13	[illegible]	68.46'
W2-14	S00°16'06"W	382.68'
W2-15	S42°35'17"W	167.93'
W2-16	S10°21'35"W	372.87'
W2-17	S18°17'07"E	463.19'
W2-18	S43°01'20"E	328.06'
W2-19	S59°22'36"E	309.07'
W2-20	S20°08'58"E	142.25'
W2-21	N80°34'49"W	429.10'
W2-22	S65°01'29"W	413.26'
W2-23	S21°40'50"W	435.09'
W2-24	S46°01'08"W	211.91'
W2-25	N10°33'03"E	335.74'
W2-26	N14°56'22"W	410.61'
W2-27	N61°06'21"W	288.18'
W2-28	S75°09'48"W	390.79'
W2-29	N81°20'03"W	126.87'
W2-30	N28°43'41"W	375.79'
W2-31	N62°56'45"W	484.09'
W2-32	N29°03'59"W	574.63'
W2-33	N65°25'27"W	347.91'
W2-34	N83°53'51"W	782.98'
W2-35	S76°08'07"W	704.68'
W2-36	S54°39'04"W	333.57'
W2-37	S20°15'50"W	376.00'
W2-38	S21°01'42"E	473.01'
W2-39	S61°17'20"E	278.15'
W2-40	S83°49'32"E	526.30'
W2-41	S05°00'54"W	318.47'
W2-42	[illegible]	54.23'
W2-43	N68°54'01"W	662.68'
W2-44	S77°46'16"W	176.06'
W2-45	S62°12'24"W	470.24'
W2-46	N28°26'17"W	1098.12'
W2-47	N54°18'30"W	607.05'
W2-48	N74°26'02"W	392.17'
W2-49	N33°30'56"W	282.50'
W2-50	N56°22'35"W	425.67'
W2-51	S85°30'35"W	239.09'
W2-52	N29°45'34"W	268.03'
W2-53	N50°08'14"W	738.29'
W2-54	N05°08'21"W	392.73'
W2-55	N27°46'35"W	352.96'
W2-56	N59°51'03"W	278.37'
W2-57	S69°28'13"W	336.32'
W2-58	N74°57'43"W	542.69'
W2-59	S88°26'40"W	1909.71'
W2-60	S79°59'33"W	439.17'
W2-61	S63°50'20"W	732.60'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-62	N56°04'00"W	227.34'
W2-63	N25°24'30"E	464.58'
W2-64	N18°04'03"W	296.63'
W2-65	N63°43'30"W	433.27'
W2-66	S80°08'34"W	915.09'
W2-67	N28°27'50"W	252.88'
W2-68	N64°24'52"W	305.68'
W2-69	S72°45'29"W	398.16'
W2-70	N74°55'52"W	173.86'
W2-71	N52°42'00"W	226.02'
W2-72	N79°47'58"W	299.39'
W2-73	N46°43'11"E	284.11'
W2-74	N76°34'43"E	426.58'
W2-75	N42°35'47"E	325.12'
W2-76	N60°36'04"E	503.70'
W2-77	N13°01'41"E	561.69'
W2-78	N17°17'21"W	501.20'
W2-79	N44°04'50"W	291.08'
W2-80	N80°00'03"W	240.83'
W2-81	S61°17'12"W	1085.75'
W2-82	N53°19'49"W	467.60'
W2-83	S73°57'53"W	537.74'
W2-84	S31°58'13"W	349.22'
W2-85	S01°01'06"W	562.53'
W2-86	S25°38'22"W	314.06'
W2-87	N44°13'22"W	427.39'
W2-88	N81°45'37"W	468.46'
W2-89	S55°14'55"W	235.37'
W2-90	S34°13'40"W	324.38'
W2-91	S78°01'52"W	295.78'
W2-92	N82°13'23"W	548.14'
W2-93	S78°07'56"W	340.08'
W2-94	S57°06'10"W	574.08'
W2-95	S32°35'34"W	413.83'
W2-96	N74°50'54"W	346.13'
W2-97	S75°34'33"W	314.25'
W2-98	S75°34'33"W	272.10'
W2-99	N32°20'45"W	411.02'
W2-100	N54°26'29"W	301.96'
W2-101	N70°10'38"W	2161.42'
W2-102	N78°22'53"W	820.47'
W2-103	[illegible]	426.95'
W2-104	N41°39'54"W	501.29'
W2-105	N85°09'21"W	533.37'
W2-106	N48°53'16"W	299.71'
W2-107	N81°29'51"W	264.28'
W2-108	N37°19'26"E	307.01'
W2-109	N04°47'49"E	433.81'
W2-110	N41°21'23"W	544.14'
W2-111	N81°28'05"W	538.04'
W2-112	S54°17'57"W	340.17'
W2-113	N38°00'38"W	353.64'
W2-114	N81°29'21"W	969.62'
W2-115	N61°05'49"W	1243.40'
W2-116	N39°06'21"W	574.15'
W2-117	N49°34'06"E	530.63'
W2-118	N07°31'51"E	549.32'
W2-119	N35°01'37"W	358.28'
W2-120	N62°43'36"W	338.63'
W2-121	N38°09'26"W	487.76'
W2-122	N89°09'10"W	592.07'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-123	N72°52'25"W	678.71'
W2-124	S84°31'45"W	150.51'
W2-125	S58°46'36"W	1091.22'
W2-126	S42°17'29"W	181.40'
W2-127	S00°24'31"W	285.93'
W2-128	S30°40'47"E	689.74'
W2-129	S80°47'00"E	581.68'
W2-130	S55°43'41"E	329.81'
W2-131	S13°23'14"W	299.93'
W2-132	S09°00'35"E	249.76'
W2-133	S73°15'50"W	256.93'
W2-134	S51°21'00"W	502.07'
W2-135	[illegible]	367.39'
W2-136	N26°15'00"W	328.08'
W2-137	N80°37'30"W	270.80'
W2-138	S64°11'54"W	657.35'
W2-139	S19°49'29"W	384.49'
W2-140	S19°05'27"E	354.45'
W2-141	S62°00'51"E	345.15'
W2-142	N66°14'32"E	495.11'
W2-143	N37°07'31"E	214.98'
W2-144	S08°23'33"E	466.58'
W2-145	S41°05'26"E	645.01'
W2-146	S65°53'55"E	393.17'
W2-147	S84°14'11"E	624.55'
W2-148	S71°42'56"W	742.17'
W2-149	S07°48'20"W	469.44'
W2-150	S37°22'35"E	747.32'
W2-151	S52°47'04"E	836.67'
W2-152	S71°25'55"E	960.11'
W2-153	S61°52'09"E	446.50'
W2-154	N85°14'42"E	564.78'
W2-155	S55°41'37"E	751.77'
W2-156	N78°27'09"E	330.22'
W2-157	S22°44'17"W	278.19'
W2-158	S08°08'02"E	328.04'
W2-159	S48°21'55"E	464.61'
W2-160	S71°33'28"E	224.57'
W2-161	S23°10'21"E	300.84'
W2-162	S53°19'47"E	1191.41'
W2-163	S73°00'50"E	341.56'
W2-164	[illegible]	[illegible]
W2-165	N60°45'32"E	666.48'
W2-166	S34°14'40"E	712.16'
W2-167	S77°51'03"E	211.17'
W2-168	S20°47'45"W	310.40'
W2-169	S00°57'08"E	243.13'
W2-170	S29°03'16"E	695.85'
W2-171	S62°46'07"E	724.34'
W2-172	S77°45'33"E	383.61'
W2-173	S28°12'18"W	395.61'
W2-174	S24°30'19"E	445.74'
W2-175	S69°14'05"E	1718.40'
W2-176	S60°37'22"E	1422.09'
W2-177	S85°16'57"E	281.02'
W2-178	S61°24'42"E	315.10'
W2-179	S20°53'44"E	433.49'
W2-180	S40°16'24"E	196.73'
W2-181	S57°43'12"E	685.00'
W2-182	S88°07'11"E	483.31'
W2-183	S22°08'16"E	187.34'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-184	S49°45'03"E	616.16'
W2-185	S38°04'22"E	533.04'
W2-186	S38°04'22"E	361.86'
W2-187	S62°25'02"E	527.05'
W2-188	N87°04'43"E	426.73'
W2-189	S26°35'34"E	128.49'
W2-190	S44°00'30"E	524.85'
W2-191	S86°39'20"E	484.45'
W2-192	N78°38'23"E	648.34'
W2-193	S78°48'35"E	317.54'
W2-194	N80°45'03"E	334.59'
W2-195	S73°53'44"E	526.97'
W2-196	[illegible]	655.50'
W2-197	N56°18'50"E	468.74'
W2-198	N76°45'35"E	230.12'
W2-199	S14°33'21"E	242.41'
W2-200	S32°31'01"E	789.53'
W2-201	S26°15'46"E	559.32'
W2-202	S47°08'15"E	233.81'
W2-203	S71°27'20"E	590.56'
W2-204	S03°29'07"E	209.33'
W2-205	S60°02'26"W	370.31'
W2-206	S18°10'25"W	466.87'
W2-207	S02°50'15"E	693.97'
W2-208	S15°12'07"E	225.65'
W2-209	S66°25'54"E	657.11'
W2-210	S83°54'00"W	259.57'
W2-211	N67°48'23"W	316.06'
W2-212	S72°55'03"W	356.26'
W2-213	S33°42'29"W	411.88'
W2-214	S15°05'19"E	678.76'
W2-215	N41°43'43"W	882.25'
W2-216	N63°45'16"W	485.99'
W2-217	N83°25'51"W	178.47'
W2-218	N43°08'48"W	267.27'
W2-219	N76°21'13"W	328.95'
W2-220	S78°53'37"W	307.55'
W2-221	S69°10'09"W	360.20'
W2-222	N24°03'36"W	504.67'
W2-223	N85°07'38"W	420.32'
W2-224	S57°56'28"W	404.70'
W2-225	[illegible]	[illegible]
W2-226	N70°24'06"W	252.03'
W2-227	N45°34'48"W	364.22'
W2-228	N73°22'22"W	265.77'
W2-229	S82°44'03"W	632.80'
W2-230	N65°53'29"W	377.87'
W2-231	N35°47'13"W	144.85'
W2-232	N65°22'48"W	311.31'
W2-233	N27°27'29"W	402.21'
W2-234	N86°22'08"W	275.76'
W2-235	S51°49'39"W	503.79'
W2-236	S84°01'34"W	164.82'
W2-237	S44°11'44"W	308.18'
W2-238	S14°07'32"E	489.48'
W2-239	S03°24'30"E	488.23'
W2-240	S32°06'00"W	319.51'
W2-241	S14°55'31"E	483.23'
W2-242	S21°03'26"W	116.31'
W2-243	N60°24'43"W	311.35'
W2-244	N36°59'32"W	231.78'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-245	N57°41'48"W	298.25'
W2-246	N42°08'24"W	725.21'
W2-247	N59°41'50"W	333.14'
W2-248	N36°02'48"W	161.70'
W2-249	N59°51'38"W	302.09'
W2-250	N45°45'01"W	253.40'
W2-251	N68°28'03"W	333.71'
W2-252	N32°57'43"W	190.56'
W2-253	N52°45'05"W	655.32'
W2-254	N81°32'10"W	427.85'
W2-255	S65°29'51"W	283.26'
W2-256	N66°46'45"W	438.23'
W2-257	[illegible]	48.85'
W2-258	N64°13'05"W	386.20'
W2-259	N23°19'30"W	238.43'
W2-260	N40°50'29"W	555.89'
W2-261	N30°03'16"W	1002.64'
W2-262	N51°38'54"W	594.43'
W2-263	S82°14'21"W	465.11'
W2-264	S52°28'27"W	291.31'
W2-265	N04°56'01"W	226.71'
W2-266	N22°24'06"W	463.73'
W2-267	N43°06'03"W	1242.29'
W2-268	N53°02'19"W	1419.74'
W2-269	S82°45'40"W	309.43'
W2-270	S32°44'49"W	307.65'
W2-271	N23°19'41"W	630.57'
W2-272	N47°46'58"W	981.43'
W2-273	N70°30'32"W	489.66'
W2-274	S77°03'52"W	403.30'
W2-275	S41°42'48"W	494.61'
W2-276	N35°31'47"W	228.91'
W2-277	N84°37'06"W	508.54'
W2-278	S48°50'26"W	316.07'
W2-279	N53°38'30"W	528.50'
W2-280	N76°50'59"W	585.90'
W2-281	S67°45'41"W	374.92'
W2-282	N33°49'33"W	267.09'
W2-283	N70°40'48"W	661.47'
W2-284	S63°39'31"W	248.90'
W2-285	S33°24'23"W	433.65'
W2-286	S76°33'07"W	242.30'
W2-287	S36°13'41"W	245.33'
W2-288	S14°16'21"W	156.67'
W2-289	N17°41'18"W	588.34'
W2-290	N69°41'40"W	296.03'
W2-291	N31°14'31"W	210.29'
W2-292	N55°43'01"W	221.13'
W2-293	N50°46'13"E	685.69'
W2-294	N06°14'23"E	235.36'
W2-295	N36°31'11"W	787.03'
W2-296	N56°38'54"W	417.04'
W2-297	N83°46'40"W	435.31'
W2-298	S69°44'58"W	210.21'
W2-299	S49°14'57"W	654.79'
W2-300	N65°22'50"W	379.83'
W2-301	N89°49'03"W	339.59'
W2-302	N03°47'00"W	307.04'
W2-303	N27°16'02"W	293.72'
W2-304	N04°30'11"E	161.19'
W2-305	N24°34'00"W	291.55'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-306	N50°23'09"W	367.04'
W2-307	N25°26'47"W	212.76'
W2-308	N44°23'26"W	168.57'
W2-309	N00°53'39"W	110.80'
W2-310	N79°12'22"E	395.85'
W2-311	N52°31'35"E	441.54'
W2-312	N19°13'34"E	365.72'
W2-313	N32°28'16"W	796.86'
W2-314	N07°13'24"W	565.19'
W2-315	N65°29'22"W	430.26'
W2-316	S63°27'22"W	288.36'
W2-317	S80°16'23"W	391.65'
W2-318	[illegible]	[illegible]
W2-319	N88°21'58"W	652.41'
W2-320	N05°19'40"W	333.49'
W2-321	N56°38'33"W	355.45'
W2-322	S73°35'33"W	519.79'
W2-323	S33°52'18"W	597.52'
W2-324	S10°16'19"E	278.44'
W2-325	S62°18'49"W	165.78'
W2-326	S24°43'35"W	255.61'
W2-327	N74°35'53"W	128.61'
W2-328	N85°56'31"W	779.14'
W2-329	S60°54'02"W	617.77'
W2-330	S34°32'52"W	222.83'
W2-331	S65°56'24"W	155.79'
W2-332	S52°10'08"W	758.25'
W2-333	S80°36'10"W	395.27'
W2-334	S56°30'19"W	470.10'
W2-335	S12°37'18"W	660.09'
W2-336	N83°08'11"W	259.11'
W2-337	S80°59'15"W	1182.20'
W2-338	N49°15'09"E	3.69'
W2-339	N15°24'41"E	1096.60'
W2-340	N52°28'30"E	1104.33'
W2-341	N30°42'56"E	787.68'
W2-342	N02°35'09"E	535.56'
W2-343	N26°09'44"W	292.90'
W2-344	N42°45'39"E	227.73'
W2-345	N05°00'50"E	202.38'
W2-346	N14°28'51"W	481.76'
W2-347	N29°03'03"W	734.65'
W2-348	N52°42'56"W	664.43'
W2-349	N78°45'07"W	524.72'
W2-350	N56°11'27"W	963.57'
W2-351	N83°10'59"W	618.76'
W2-352	S52°18'37"W	358.90'
W2-353	S02°49'11"W	421.36'
W2-354	S22°26'30"E	558.32'
W2-355	N53°49'48"W	522.72'
W2-356	S85°18'58"W	191.92'
W2-357	N45°19'04"W	259.69'
W2-358	N68°38'55"W	173.26'
W2-359	N39°25'20"W	743.21'
W2-360	N59°00'44"W	220.00'
W2-361	S85°39'29"W	355.03'
W2-362	S53°10'16"W	228.97'
W2-363	S83°19'43"W	205.32'
W2-364	N41°23'45"W	211.08'
W2-365	N60°07'19"W	210.66'
W2-366	S84°52'16"W	302.46'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-367	N62°42'50"W	1460.32
W2-368	N54°35'20"W	374.46
W2-369	N62°35'25"W	848.58
W2-370	N75°09'49"W	228.51
W2-371	N81°34'28"W	500.77
W2-372	S89°09'26"W	1994.00'
W2-373	S55°44'40"W	588.87'
W2-374	N84°52'29"W	320.72'
W2-375	S52°32'13"W	537.56'
W2-376	S01°50'11"W	642.86'
W2-377	S44°38'25"W	412.66'
W2-378	S01°58'48"E	343.34'
W2-379	[illegible]	138.00
W2-380	S31°28'41"W	375.83'
W2-381	S00°13'04"W	549.44'
W2-382	S57°25'36"W	476.22'
W2-383	S32°40'15"W	234.95'
W2-384	S11°41'22"W	1265.17
W2-385	S26°46'29"W	361.82'
W2-386	N37°46'12"W	166.78'
W2-387	N51°39'45"W	294.37'
W2-388	N69°50'44"W	603.01
W2-389	S89°32'21"W	439.36
W2-390	S60°22'57"W	244.04'
W2-391	N15°18'03"W	246.53'
W2-392	N41°25'09"W	311.52'
W2-393	N76°19'56"W	405.22'
W2-394	S55°42'19"W	419.33'
W2-395	S17°55'56"W	501.90'
W2-396	S04°58'59"E	647.89
W2-397	S26°32'05"W	188.80
W2-398	S02°43'39"W	412.97
W2-399	S42°07'33"W	498.71
W2-400	N08°21'44"W	424.87'
W2-401	N45°42'44"E	302.11
W2-402	N07°27'22"W	409.88'
W2-403	N05°36'32"E	308.84'
W2-404	N28°42'56"W	256.52'
W2-405	N54°18'58"W	757.31'
W2-406	S83°27'06"W	212.28'
W2-407	S46°47'13"W	647.09'
W2-408	S89°03'30"W	380.33
W2-409	S30°37'19"W	712.2
W2-410	S10°51'38"W	197.52
W2-411	S25°15'19"E	1277.82
W2-412	S46°16'54"E	382.38
W2-413	S72°19'17"E	392.31
W2-414	S12°01'35"E	221.29'
W2-415	S44°42'44"W	258.36'
W2-416	N64°32'29"W	408.01'
W2-417	N40°10'22"W	518.10'
W2-418	N50°49'19"W	1153.57'
W2-419	N71°44'24"W	1849.03'
W2-420	N85°32'57"W	335.84
W2-421	S68°25'37"W	544.66
W2-422	S46°56'08"W	778.32
W2-423	N21°49'25"W	232.18
W2-424	N68°13'02"W	547.30'
W2-425	N05°32'32"W	557.84'
W2-426	N20°33'31"W	271.95'
W2-427	N45°52'59"E	379.00'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-428	N13°59'24"E	319.85'
W2-429	N09°35'00"W	638.30'
W2-430	N41°22'40"E	470.39'
W2-431	N15°27'31"E	623.49'
W2-432	N22°07'33"E	642.47'
W2-433	N41°25'59"E	1245.48'
W2-434	N10°45'40"E	686.65'
W2-435	N27°27'22"E	842.87'
W2-436	N39°16'26"E	1067.35'
W2-437	N51°36'51"E	651.66'
W2-438	N69°19'57"E	257.35'
W2-439	S86°13'29"E	491.39'
W2-440	N49°29'59"E	265.43'
W2-441	N25°38'19"E	667.52'
W2-442	N35°09'15"E	514.18'
W2-443	N62°27'59"E	931.88'
W2-444	N10°34'33"E	830.07'
W2-445	N04°28'10"W	848.34'
W2-446	N19°54'09"E	202.77'
W2-447	N59°30'15"E	589.40'
W2-448	N72°01'22"E	146.74'
W2-449	N32°44'20"E	291.36'
W2-450	N14°57'32"W	343.71'
W2-451	N59°33'37"W	598.97'
W2-452	N32°42'08"W	503.11'
W2-453	N46°36'33"W	262.25'
W2-454	N14°57'02"W	332.03'
W2-455	N46°04'51"W	579.74'
W2-456	N78°58'44"W	265.85'
W2-457	N35°08'15"W	366.48'
W2-458	N59°19'34"W	797.81'
W2-459	N49°45'22"W	453.52'
W2-460	N70°56'28"W	246.47'
W2-461	N40°56'47"W	717.58'
W2-462	N77°38'46"W	390.16'
W2-463	S59°57'37"W	758.16'
W2-464	N00°03'56"E	449.66'
W2-465	N42°59'40"W	574.01'
W2-466	N72°16'25"W	394.31'
W2-467	N88°02'02"W	152.54'
W2-468	N49°38'33"W	132.49'
W2-469	[illegible]	[illegible]
W2-470	S86°43'55"W	412.66
W2-471	S59°18'54"W	405.84'
W2-472	S31°38'57"W	148.46'
W2-473	N55°21'44"W	159.21'
W2-474	N12°50'55"W	233.65'
W2-475	N38°15'21"W	282.29'
W2-476	N65°44'25"W	276.01'
W2-477	S63°35'26"W	420.04'
W2-478	S27°10'52"W	716.32'
W2-479	S17°46'28"E	466.91'
W2-480	S23°41'52"W	268.75'
W2-481	S05°08'59"W	518.86'
W2-482	S28°44'31"W	383.69'
W2-483	N07°09'31"E	675.90'
W2-484	N25°24'44"W	497.77'
W2-485	N52°31'16"W	453.69'
W2-486	S89°06'09"W	712.62'
W2-487	N20°49'45"W	737.38'
W2-488	N77°00'58"W	399.58'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-489	N49°52'42"W	921.81'
W2-490	N78°36'03"W	430.59'
W2-491	S59°09'42"W	551.62'
W2-492	S19°17'40"W	943.45'
W2-493	S46°51'58"W	1172.37'
W2-494	S23°35'05"W	2132.64'
W2-495	S02°43'25"E	948.55'
W2-496	S29°04'10"W	1124.88'
W2-497	S03°00'37"W	217.87'
W2-498	S25°09'56"W	417.32'
W2-499	S05°53'24"W	216.61'
W2-500	S18°27'39"E	537.26'
W2-501	S75°53'20"E	579.84'
W2-502	S44°02'22"E	992.88'
W2-503	N89°42'54"E	979.32'
W2-504	S68°55'45"E	389.72'
W2-505	N79°23'20"E	634.46'
W2-506	S49°26'32"E	326.36'
W2-507	S00°55'14"W	3219.64'
W2-508	S43°23'59"W	708.90'
W2-509	N10°31'34"W	452.33'
W2-510	N50°38'11"W	188.46'
W2-511	N23°31'02"E	243.03'
W2-512	N06°37'09"E	826.98'
W2-513	N10°53'59"W	458.93'
W2-514	N39°23'06"W	373.92'
W2-515	N69°29'10"W	233.21'
W2-516	N40°46'44"W	172.91'
W2-517	N74°44'18"W	614.66'
W2-518	N54°01'16"W	1371.41'
W2-519	N89°25'24"W	584.46'
W2-520	S63°48'20"W	1256.57'
W2-521	S51°00'37"W	471.07'
W2-522	S38°20'16"W	346.05'
W2-523	S38°20'16"W	447.76'
W2-524	N09°31'04"W	393.94'
W2-525	N52°59'39"W	279.37'
W2-526	N12°31'59"E	933.82'
W2-527	N04°35'25"W	503.85'
W2-528	N22°05'42"W	1121.10'
W2-529	N40°35'50"W	281.79'
W2-530	[illegible]	546.26'
W2-531	N23°03'45"W	458.37
W2-532	N52°44'29"W	1443.70'
W2-533	N75°19'30"W	455.51'
W2-534	S80°13'45"W	573.83'
W2-535	N33°02'16"W	1248.55'
W2-536	N55°49'54"W	463.81'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-537	S83°13'04"W	739.24'
W2-538	S50°18'59"W	268.65'
W2-539	N14°50'26"E	544.27'
W2-540	N01°05'54"E	930.97'
W2-541	N28°25'14"E	599.52'
W2-542	N13°09'42"W	275.30'
W2-543	N33°46'47"E	204.30'
W2-544	N07°50'14"E	324.50'
W2-545	N18°35'37"W	554.72'
W2-546	N43°13'21"W	109.72'
W2-547	N19°12'01"E	230.74'
W2-548	N00°58'39"W	1068.93'
W2-549	N65°12'25"E	637.46'
W2-550	N52°13'41"E	642.19'
W2-551	N23°08'44"E	740.23'
W2-552	N28°18'18"E	552.33'
W2-553	N25°28'00"E	358.46'
W2-554	N04°42'21"W	800.98'
W2-555	N24°29'55"W	487.68'
W2-556	N70°37'53"W	289.80'
W2-557	S58°09'45"W	349.84'
W2-558	N30°50'27"W	585.23'
W2-559	N74°07'53"W	436.76'
W2-560	N24°05'07"W	395.75'
W2-561	N74°25'39"W	309.83'
W2-562	S50°37'30"W	472.24'
W2-563	N01°07'09"E	493.25'
W2-564	N27°54'16"W	222.69'
W2-565	N45°02'26"E	897.16'
W2-566	N05°41'16"E	539.45'
W2-567	N18°29'55"W	381.13'
W2-568	N53°40'52"W	146.77'
W2-569	N07°20'12"W	405.31'
W2-570	N02°29'31"E	692.25'
W2-571	N19°21'38"W	639.57'
W2-572	N55°54'50"W	199.15'
W2-573	N08°50'50"E	294.98'
W2-574	N26°10'16"W	690.24'
W2-575	N42°06'24"W	795.86'
W2-576	N58°27'58"W	277.88'
W2-577	N26°17'41"W	250.89'
W2-578	N47°59'39"W	384.46'
W2-579	N65°36'25"W	462.35'
W2-580	N79°22'18"W	156.71'
W2-581	N50°47'48"W	146.76'
W2-582	N09°48'27"W	311.70'
W2-583	N47°18'28"W	615.32'
W2-584	N73°19'20"W	385.56'

Book 938

Pgs. 11-23

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 9 OF 21

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-585	N17°47'35"W	123.69'
W2-586	N31°16'55"W	363.79'
W2-587	N48°32'44"W	342.51'
W2-588	N70°31'05"W	113.10'
W2-589	N16°46'13"W	219.93'
W2-590	N52°20'25"W	204.44'
W2-591	N10°01'04"W	401.71'
W2-592	N51°34'22"W	399.45'
W2-593	N01°37'21"W	207.12'
W2-594	N38°55'31"W	396.01'
W2-595	N51°00'12"W	562.42'
W2-596	N68°32'51"W	197.38'
W2-597	N33°45'59"W	30.83'
W2-598	N46°08'00"W	381.30'
W2-599	S45°06'01"W	338.81'
W2-600	N39°05'06"W	339.94'
W2-601	N61°29'23"W	237.08'
W2-602	N25°32'04"E	344.52'
W2-603	N72°19'01"W	500.48'
W2-604	N82°30'06"W	228.16'
W2-605	S68°03'47"W	308.82'
W2-606	N84°52'14"W	220.26'
W2-607	S63°58'41"W	436.97'
W2-608	S21°53'58"W	270.88'
W2-609	S64°07'40"W	337.61'
W2-610	S29°32'13"W	236.68'
W2-611	N37°15'09"W	185.39'
W2-612	N71°28'58"W	210.61'
W2-613	S72°48'41"W	439.24'
W2-614	S35°42'33"W	494.38'
W2-615	N33°03'51"W	212.60'
W2-616	N47°36'26"E	246.59'
W2-617	N09°48'13"E	260.34'
W2-618	N49°04'08"E	495.66'
W2-619	N05°28'59"E	238.54'
W2-620	N05°28'59"E	164.58'
W2-621	N83°30'51"E	221.48'
W2-622	S73°15'21"E	418.05'
W2-623	N85°22'15"E	500.60'
W2-624	N46°52'16"E	366.41'
W2-625	N10°28'29"W	366.57'
W2-626	[illegible]	[illegible]
W2-627	N70°29'16"W	560.78'
W2-628	N54°52'27"W	693.21'
W2-629	N33°49'42"W	624.81'
W2-630	N48°31'09"W	399.62'
W2-631	N72°34'33"W	285.36'
W2-632	N03°10'07"E	240.56'
W2-633	N38°09'10"W	335.06'
W2-634	N09°55'47"W	218.32'
W2-635	N35°18'56"W	220.24'
W2-636	N09°38'12"E	346.50'
W2-637	N23°15'48"W	553.36'
W2-638	N49°13'50"W	295.85'
W2-639	N66°30'36"W	160.73'
W2-640	N16°55'55"W	375.09'
W2-641	N84°27'22"E	467.20'
W2-642	N51°35'38"E	486.58'
W2-643	N11°32'09"E	698.23'
W2-644	N30°49'01"E	485.38'
W2-645	N01°07'14"W	210.06'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-646	N84°06'40"E	161.07'
W2-647	S01°29'04"E	275.76'
W2-648	S50°35'08"E	689.85'
W2-649	S35°22'20"E	2237.55'
W2-650	S02°35'49"E	1424.42'
W2-651	S87°23'51"E	764.68'
W2-652	N14°33'25"E	1523.68'
W2-653	N21°11'18"W	267.76'
W2-654	N02°08'04"E	698.72'
W2-655	N27°25'45"W	166.82'
W2-656	N00°35'50"E	154.24'
W2-657	N32°51'51"W	278.39'
W2-658	[illegible]	[illegible]
W2-659	N07°17'27"E	339.00'
W2-660	N29°28'22"W	820.80'
W2-661	N40°04'35"W	918.69'
W2-662	N14°25'53"W	1213.86'
W2-663	N45°58'58"W	362.89'
W2-664	N35°48'13"E	524.80'
W2-665	N09°25'56"E	730.91'
W2-666	N21°16'48"W	203.89'
W2-667	N62°22'38"W	256.32'
W2-668	S81°29'18"W	149.17'
W2-669	N27°30'29"W	256.65'
W2-670	N36°03'41"W	314.74'
W2-671	N39°30'51"W	634.15'
W2-672	N48°00'37"W	260.43'
W2-673	N37°03'47"W	180.54'
W2-674	N51°35'02"W	228.25'
W2-675	N56°24'29"W	195.42'
W2-676	N45°07'43"W	1438.46'
W2-677	N45°56'45"W	3790.62'
W2-678	N52°39'14"W	584.58'
W2-679	N48°16'44"W	1084.66'
W2-680	N47°28'10"W	554.88'
W2-681	N38°36'53"W	586.11'
W2-682	N37°09'18"W	742.52'
W2-683	N44°19'13"W	4763.57'
W2-684	N45°44'30"W	3175.62'
W2-685	N45°33'31"W	109.21'
W2-686	N43°29'22"W	153.48'
W2-687	N40°43'45"W	90.22'
W2-688	N37°30'14"W	208.99'
W2-689	N33°26'34"W	284.68'
W2-690	N30°54'14"W	2946.05'
W2-691	N32°25'47"E	275.82'
W2-692	N09°57'31"W	592.97'
W2-693	N23°18'54"E	227.55'
W2-694	N01°37'50"E	569.59'
W2-695	N15°45'31"W	895.33'
W2-696	N32°21'07"W	723.15'
W2-697	N63°36'42"W	487.44'
W2-698	N24°38'55"W	663.31'
W2-699	N00°54'53"W	395.05'
W2-700	N18°41'04"W	200.25'
W2-701	N44°06'42"W	281.68'
W2-702	N15°44'37"E	448.28'
W2-703	N58°05'09"E	267.34'
W2-704	N25°48'20"E	223.23'
W2-705	N00°41'46"W	360.43'
W2-706	N42°46'53"W	648.74'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-707	N19°51'27"W	272.78'
W2-708	N35°01'17"W	1032.11'
W2-709	N30°52'04"W	975.30'
W2-710	N54°23'25"W	396.16'
W2-711	N38°18'24"W	382.48'
W2-712	N68°10'50"W	360.63'
W2-713	N48°24'34"W	616.67'
W2-714	N17°13'02"W	674.26'
W2-715	N40°39'26"W	1830.96'
W2-716	N78°13'37"W	190.09'
W2-717	N41°06'45"W	68.56'
W2-718	N18°54'29"W	211.18'
W2-719	N46°35'00"W	959.07'
W2-720	N53°36'57"W	714.21'
W2-721	N85°29'03"W	429.26'
W2-722	N71°40'15"W	575.02'
W2-723	N63°31'52"W	1583.52'
W2-724	S81°54'54"W	467.75'
W2-725	S46°46'24"W	409.81'
W2-726	S24°09'38"W	397.20'
W2-727	N61°34'21"W	793.63'
W2-728	N71°01'58"W	753.94'
W2-729	N44°00'57"W	995.00'
W2-730	N59°22'15"W	760.94'
W2-731	N84°40'03"W	211.22'
W2-732	N35°06'28"W	486.98'
W2-733	N64°04'13"W	753.48'
W2-734	N52°55'20"W	318.91'
W2-735	N69°35'10"W	188.16'
W2-736	S78°45'00"W	153.97'
W2-737	S55°18'30"W	280.93'
W2-738	N64°45'10"W	900.84'
W2-739	S48°01'31"W	581.17'
W2-740	S04°52'31"W	425.84'
W2-741	N74°30'45"W	200.94'
W2-742	S77°07'45"W	359.75'
W2-743	N80°59'45"W	268.84'
W2-744	N84°46'26"W	592.14'
W2-745	S74°48'33"W	324.67'
W2-746	N54°47'03"W	775.49'
W2-747	N86°15'00"W	210.92'
W2-748	S58°07'30"W	90.45'
W2-749	S24°22'30"W	190.48'
W2-750	S03°45'05"E	189.07'
W2-751	N51°51'00"W	165.33'
W2-752	N51°39'11"W	93.10'
W2-753	N43°42'02"W	133.26'
W2-754	N43°37'25"W	81.39'
W2-755	N42°42'32"W	10.08'
W2-756	N70°16'19"W	19.31'
W2-757	N46°04'47"W	149.81'
W2-758	N32°57'43"W	65.44'
W2-759	N33°40'14"W	16.83'
W2-760	N23°05'59"W	71.02'
W2-761	N22°35'11"W	12.32'
W2-762	N29°51'04"W	13.58'
W2-763	N30°29'35"W	77.74'
W2-764	N30°32'07"W	26.07'
W2-765	N30°39'26"W	39.80'
W2-766	N16°14'42"W	161.30'
W2-767	N06°51'41"W	42.27'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-768	N05°02'34"E	54.02'
W2-769	N24°01'22"E	18.59'
W2-770	N23°17'49"E	44.46'
W2-771	N31°19'19"E	83.49'
W2-772	N46°02'37"E	271.40'
W2-773	N41°18'30"E	275.36'
W2-774	N36°22'01"E	100.42'
W2-775	N25°36'48"E	81.68'
W2-776	N18°50'32"E	27.53'
W2-777	N18°33'14"E	18.33'
W2-778	N04°35'49"W	100.61'
W2-779	N24°20'38"W	46.75'
W2-780	[illegible]	56.62'
W2-781	N19°14'06"W	57.83'
W2-782	N05°00'42"W	46.87'
W2-783	N05°20'00"W	125.66'
W2-784	N05°27'54"W	15.39'
W2-785	N05°17'08"W	13.19'
W2-786	N01°02'03"E	34.23'
W2-787	N01°02'09"E	5.83'
W2-788	N07°41'04"W	105.35'
W2-789	N17°36'34"W	149.87'
W2-790	N08°15'55"E	16.15'
W2-791	N38°33'24"W	12.76'
W2-792	N10°00'53"W	271.19'
W2-793	N17°23'41"W	107.46'
W2-794	N10°21'20"W	105.85'
W2-795	N11°03'28"W	24.95'
W2-796	N01°43'55"W	120.30'
W2-797	N29°01'54"E	76.70'
W2-798	N50°16'12"E	36.80'
W2-799	N58°04'27"E	80.98'
W2-800	N70°29'48"E	74.73'
W2-801	N85°47'48"E	111.67'
W2-802	N85°38'32"E	81.37'
W2-803	N72°40'32"E	120.23'
W2-804	N64°23'44"E	71.46'
W2-805	N53°45'39"E	52.91'
W2-806	N38°50'38"E	136.88'
W2-807	N26°42'11"E	119.98'
W2-808	N12°34'12"E	171.31'
W2-809	N27°56'29"E	44.75'
W2-810	N44°03'32"E	43.83'
W2-811	N79°18'20"E	87.78'
W2-812	N76°45'52"E	171.37'
W2-813	N82°05'42"E	89.06'
W2-814	N74°30'34"E	168.99'
W2-815	N80°12'35"E	145.44'
W2-816	N80°10'58"E	88.99'
W2-817	N58°31'11"E	104.33'
W2-818	N52°38'04"E	99.66'
W2-819	N40°38'37"E	62.39'
W2-820	N30°42'08"E	344.88'
W2-821	N31°23'42"E	20.68'
W2-822	N30°35'48"E	62.37'
W2-823	N30°12'01"E	20.85'
W2-824	N25°44'49"E	49.30'
W2-825	N25°22'41"E	115.50'
W2-826	N16°43'15"E	33.28'
W2-827	N15°54'57"E	50.86'
W2-828	N16°19'18"E	52.85'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-829	N05°54'19"E	68.33'
W2-830	N00°47'10"W	64.11'
W2-831	N16°14'31"W	60.63'
W2-832	N41°02'46"W	59.36'
W2-833	N19°48'16"W	17.14'
W2-834	N04°54'05"E	60.21'
W2-835	N35°35'34"E	74.72'
W2-836	N35°18'38"E	109.28'
W2-837	N28°38'18"E	189.83'
W2-838	N14°21'09"E	61.74'
W2-839	N07°18'13"E	199.27'
W2-840	N17°05'01"E	224.68'
W2-841	[illegible]	99.38'
W2-842	N41°28'22"E	55.50'
W2-843	N55°56'15"E	58.90'
W2-844	N70°59'46"E	70.15'
W2-845	S83°15'42"E	40.26'
W2-846	S65°23'10"E	50.05'
W2-847	S43°07'30"E	86.27'
W2-848	S61°13'10"E	57.08'
W2-849	S61°16'20"E	42.30'
W2-850	S81°06'59"E	117.23'
W2-851	N77°44'52"E	131.55'
W2-852	N57°00'41"E	96.32'
W2-853	N43°48'59"E	70.95'
W2-854	N34°39'37"E	79.15'
W2-855	N22°24'42"E	43.79'
W2-856	N22°09'20"E	50.74'
W2-857	N02°46'10"E	124.22'
W2-858	N29°23'51"W	78.54'
W2-859	N34°22'54"W	127.77'
W2-860	N21°53'32"W	26.09'
W2-861	N04°39'27"E	32.11'
W2-862	N52°09'04"E	15.66'
W2-863	N74°13'10"E	41.55'
W2-864	S89°43'42"E	82.75'
W2-865	N89°38'49"E	45.30'
W2-866	S81°30'17"E	123.27'
W2-867	N89°50'13"E	105.12'
W2-868	N89°47'50"E	84.79'
W2-869	N77°57'08"E	88.52'
W2-870	[illegible]	45.93'
W2-871	N70°24'30"E	58.94'
W2-872	N62°20'34"E	49.31'
W2-873	N40°38'39"E	61.92'
W2-874	N40°14'05"E	121.70'
W2-875	S87°53'05"E	57.49'
W2-876	S88°12'48"E	54.87'
W2-877	N86°32'40"E	9.32'
W2-878	N85°48'04"E	27.99'
W2-879	N84°06'19"E	9.07'
W2-880	N71°06'36"E	27.79'
W2-881	N70°55'00"E	42.36'
W2-882	N58°43'25"E	42.25'
W2-883	N58°03'15"E	10.04'
W2-884	N27°09'42"E	21.09'
W2-885	N26°54'54"E	18.62'
W2-886	N25°31'19"E	11.20'
W2-887	N07°19'33"E	47.62'
W2-888	N06°55'36"E	19.77'
W2-889	N07°11'48"E	43.21'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-890	N18°27'48"E	100.75'
W2-891	N09°51'17"E	28.37'
W2-892	N07°54'49"E	12.10'
W2-893	N24°31'49"E	30.57'
W2-894	N45°10'27"E	11.67'
W2-895	N43°18'59"E	34.95'
W2-896	N41°45'26"E	12.01'
W2-897	N43°38'24"E	12.86'
W2-898	N43°16'33"E	38.86'
W2-899	N41°36'10"E	12.94'
W2-900	N43°40'20"E	28.71'
W2-901	N42°55'04"E	23.48'
W2-902	[illegible]	[illegible]
W2-903	N23°54'37"E	13.44'
W2-904	N23°00'35"E	31.02'
W2-905	N23°15'52"E	76.71'
W2-906	N01°01'31"E	37.87'
W2-907	N42°08'37"W	8.49'
W2-908	N02°13'04"W	71.84'
W2-909	N14°38'45"E	144.24'
W2-910	N28°13'14"E	92.11'
W2-911	N45°28'44"E	157.11'
W2-912	N56°17'46"E	231.37'
W2-913	N47°23'49"E	110.29'
W2-914	N36°47'21"E	78.98'
W2-915	N42°25'20"E	248.03'
W2-916	N48°02'00"E	117.47'
W2-917	N33°16'03"E	146.37'
W2-918	N41°08'59"E	50.00'
W2-919	N49°22'27"E	42.74'
W2-920	N52°08'42"E	5.22'
W2-921	N62°30'49"E	41.96'
W2-922	N63°25'50"E	7.86'
W2-923	N70°55'45"E	22.26'
W2-924	N70°54'24"E	34.93'
W2-925	N88°03'37"E	119.76'
W2-926	N81°29'59"E	46.21'
W2-927	N68°35'44"E	73.49'
W2-928	N51°55'12"E	93.52'
W2-929	N52°00'29"E	60.15'
W2-930	N48°21'47"E	276.72'
W2-931	[illegible]	[illegible]
W2-932	N75°17'49"E	14.78'
W2-933	S62°06'12"E	32.22'
W2-934	S24°47'53"E	105.98'
W2-935	S24°56'21"E	53.05'
W2-936	N15°00'44"E	42.03'
W2-937	S45°39'01"E	43.47'
W2-938	S45°39'01"E	4.82'
W2-939	N28°10'54"E	182.52'
W2-940	N41°18'13"E	227.19'
W2-941	N31°25'12"E	89.49'
W2-942	N22°27'37"E	131.04'
W2-943	N13°43'41"E	73.90'
W2-944	N01°01'15"E	32.04'
W2-945	N24°24'01"W	41.93'
W2-946	N40°58'16"W	30.37'
W2-947	N40°43'50"W	44.90'
W2-948	N19°30'30"W	51.32'
W2-949	N05°16'16"W	34.43'
W2-950	N02°11'17"E	99.79'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-951	N11°09'10"E	193.07'
W2-952	N20°23'16"E	120.80'
W2-953	N44°38'56"E	69.42'
W2-954	N74°59'48"E	64.63'
W2-955	S78°37'15"E	58.72'
W2-956	S78°20'26"E	61.14'
W2-957	S46°18'30"E	32.77'
W2-958	S60°47'46"E	33.92'
W2-959	S49°36'47"E	59.70'
W2-960	S67°27'03"E	38.69'
W2-961	S88°58'48"E	67.93'
W2-962	N71°18'18"E	10.79'
W2-963	N67°08'28"E	[illegible]
W2-964	N49°21'25"E	45.46'
W2-965	N34°19'08"E	69.27'
W2-966	N16°05'30"E	84.84'
W2-967	N23°58'57"E	56.55'
W2-968	N08°28'37"E	123.02'
W2-969	N17°21'06"E	114.58'
W2-970	N06°30'55"E	42.43'
W2-971	N16°19'09"E	77.01'
W2-972	N09°53'54"E	218.17'
W2-973	N32°29'12"E	42.26'
W2-974	N52°44'44"E	22.92'
W2-975	S88°58'50"E	27.87'
W2-976	S71°34'11"E	60.84'
W2-977	S50°50'35"E	48.35'
W2-978	S35°06'35"E	37.42'
W2-979	S50°19'31"E	51.30'
W2-980	S38°59'03"E	99.34'
W2-981	S69°01'29"E	23.47'
W2-982	N80°41'23"E	34.52'
W2-983	N60°03'33"E	46.71'
W2-984	N26°46'39"E	30.73'
W2-985	N26°49'10"E	38.02'
W2-986	N11°57'25"E	12.24'
W2-987	N10°39'39"E	22.53'
W2-988	N30°12'01"E	82.16'
W2-989	N53°28'43"E	40.63'
W2-990	N50°02'56"E	5.00'
W2-991	N71°22'32"E	37.91'
W2-992	[illegible]	[illegible]
W2-993	N25°36'28"E	132.54'
W2-994	N20°09'22"E	98.28'
W2-995	N21°48'22"E	16.36'
W2-996	N85°36'33"E	15.45'
W2-997	N87°36'05"E	6.11'
W2-998	N86°29'51"E	69.30'
W2-999	N69°22'02"E	24.67'
W2-1000	S74°53'57"E	261.86'
W2-1001	N88°38'34"E	105.46'
W2-1002	N66°10'12"E	68.45'
W2-1003	N52°55'16"E	50.16'
W2-1004	N35°10'23"E	20.68'
W2-1005	N15°40'51"E	49.30'
W2-1006	N05°46'18"W	81.04'
W2-1007	N01°51'45"E	39.33'
W2-1008	N04°21'18"E	29.91'
W2-1009	N27°32'52"E	40.29'
W2-1010	N56°01'42"E	13.82'
W2-1011	N56°01'42"E	35.07'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1012	N71°35'02"E	29.55'
W2-1013	N87°34'19"E	266.66'
W2-1014	S75°03'51"E	74.16'
W2-1015	S62°28'39"E	26.92'
W2-1016	S40°35'58"E	51.14'
W2-1017	S29°22'14"E	51.07'
W2-1018	S06°45'34"E	133.03'
W2-1019	S18°47'23"E	100.23'
W2-1020	S43°56'33"E	50.94'
W2-1021	S59°14'23"E	60.18'
W2-1022	S78°50'16"E	239.74'
W2-1023	N76°02'44"E	132.51'
W2-1024	N43°29'02"E	26.65'
W2-1025	N02°07'56"E	104.15'
W2-1026	N20°11'18"E	36.24'
W2-1027	N35°52'07"E	38.60'
W2-1028	N58°32'49"E	71.22'
W2-1029	N85°49'39"E	44.30'
W2-1030	S76°26'21"E	129.06'
W2-1031	S82°38'12"E	36.22'
W2-1032	S70°09'26"E	31.59'
W2-1033	N86°05'58"E	72.25'
W2-1034	N54°29'34"E	29.98'
W2-1035	N29°00'10"E	27.21'
W2-1036	N28°16'27"E	33.59'
W2-1037	N14°35'42"E	24.72'
W2-1038	N04°43'09"W	98.80'
W2-1039	N14°43'52"W	31.02'
W2-1040	N15°24'29"W	62.63'
W2-1041	N25°42'39"W	7.75'
W2-1042	N25°09'55"W	24.34'
W2-1043	N26°22'43"W	8.20'
W2-1044	N08°14'52"W	48.70'
W2-1045	N22°01'13"W	5.93'
W2-1046	N22°40'29"W	59.24'
W2-1047	N12°08'17"W	43.37'
W2-1048	N06°33'25"E	42.07'
W2-1049	N37°59'26"E	16.41'
W2-1050	N36°28'47"E	21.01'
W2-1051	N54°24'39"E	27.48'
W2-1052	N55°55'37"E	17.74'
W2-1053	[illegible]	[illegible]
W2-1054	N70°52'39"E	20.10'
W2-1055	N69°49'15"E	17.12'
W2-1056	N88°10'04"E	124.68'
W2-1057	N87°42'32"E	69.49'
W2-1058	N73°55'46"E	121.46'
W2-1059	N49°13'39"E	147.54'
W2-1060	N40°57'59"E	56.05'
W2-1061	N40°36'31"E	125.69'
W2-1062	N38°43'05"E	15.19'
W2-1063	N39°34'20"E	9.78'
W2-1064	N38°13'09"E	28.80'
W2-1065	N36°56'34"E	9.89'
W2-1066	N38°21'24"E	32.06'
W2-1067	N43°09'17"E	18.17'
W2-1068	N41°58'10"E	124.87'
W2-1069	N33°25'46"E	25.45'
W2-1070	N32°46'54"E	51.82'
W2-1071	N32°53'00"E	153.92'
W2-1072	N52°50'39"E	58.33'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1073	S85°03'40"E	58.48'
W2-1074	S68°21'56"E	40.32'
W2-1075	S41°30'05"E	29.64'
W2-1076	S25°36'40"E	53.76'
W2-1077	S10°51'43"E	67.72'
W2-1078	S25°28'21"E	35.80'
W2-1079	S40°10'24"E	39.67'
W2-1080	S66°53'58"E	21.30'
W2-1081	N77°31'00"E	205.96'
W2-1082	N88°06'55"E	72.08'
W2-1083	S81°03'57"E	206.02'
W2-1084	S81°29'10"E	58.55'
W2-1085	S87°58'52"E	86.08'
W2-1086	S87°54'35"E	77.22'
W2-1087	S88°04'19"E	90.86'
W2-1088	S72°06'30"E	75.23'
W2-1089	S53°48'20"E	48.66'
W2-1090	S62°30'48"E	22.05'
W2-1091	S62°16'35"E	54.27'
W2-1092	S44°12'45"E	27.40'
W2-1093	S44°00'08"E	78.80'
W2-1094	S44°03'09"E	18.04'
W2-1095	S58°28'07"E	67.39'
W2-1096	S75°12'07"E	41.24'
W2-1097	N85°48'29"E	92.39'
W2-1098	N85°02'27"E	14.01'
W2-1099	N78°57'48"E	57.58'
W2-1100	N78°50'04"E	46.62'
W2-1101	N69°48'29"E	94.64'
W2-1102	N62°09'12"E	35.46'
W2-1103	N61°03'02"E	49.58'
W2-1104	N48°06'09"E	76.48'
W2-1105	N22°14'15"E	76.95'
W2-1106	N02°45'50"E	66.30'
W2-1107	N14°24'31"W	60.05'
W2-1108	N02°16'16"E	92.14'
W2-1109	N27°54'21"E	35.93'
W2-1110	N49°52'32"E	60.89'
W2-1111	N65°50'41"E	77.93'
W2-1112	N65°47'38"E	114.53'
W2-1113	N74°28'07"E	62.68'
W2-1114	N89°42'03"E	79.84'
W2-1115	S78°51'25"E	124.13'
W2-1116	S72°19'19"E	181.49'
W2-1117	N88°58'30"E	164.39'
W2-1118	S79°38'50"E	147.96'
W2-1119	S70°53'10"E	71.46'
W2-1120	S57°44'51"E	114.41'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1121	S70°52'28"E	49.17'
W2-1122	S67°06'37"E	286.21'
W2-1123	S53°23'34"E	78.18'
W2-1124	S65°56'03"W	116.00'
W2-1125	S40°46'22"E	28.32'
W2-1126	S41°11'48"E	39.32'
W2-1127	S32°24'38"E	12.65'
W2-1128	S32°12'48"E	36.56'
W2-1129	S32°12'47"E	12.19'
W2-1130	S32°59'48"E	11.42'
W2-1131	S32°06'34"E	33.47'
W2-1132	S32°48'11"E	10.96'
W2-1133	[illegible]	8.06'
W2-1134	S31°43'52"E	13.42'
W2-1135	S37°53'16"E	39.30'
W2-1136	S37°33'26"E	32.59'
W2-1137	S37°33'25"E	30.73'
W2-1138	S26°38'40"E	14.39'
W2-1139	S27°18'16"E	15.30'
W2-1140	S26°59'04"E	16.08'
W2-1141	S26°16'54"E	27.86'
W2-1142	S26°43'54"E	19.33'
W2-1143	S26°40'18"E	15.62'
W2-1144	S26°45'35"E	21.81'
W2-1145	S26°51'05"E	36.65'
W2-1146	S31°01'17"E	27.92'
W2-1147	S30°43'16"E	20.98'
W2-1148	S30°45'13"E	36.40'
W2-1149	S30°50'13"E	77.58'
W2-1150	S35°51'05"E	30.49'
W2-1151	S35°40'00"E	108.10'
W2-1152	S35°38'21"E	35.79'
W2-1153	S45°57'34"E	158.45'
W2-1154	S55°16'02"E	108.20'
W2-1155	S66°38'44"E	132.13'
W2-1156	S78°51'59"E	101.43'
W2-1157	S74°35'01"E	330.57'
W2-1158	S70°45'51"E	60.51'
W2-1159	S70°25'35"E	34.30'
W2-1160	S59°14'07"E	181.90'
W2-1161	S89°42'11"E	148.05'
W2-1162	[illegible]	[illegible]
W2-1163	N72°58'27"E	250.61'
W2-1164	N79°47'17"E	114.22'
W2-1165	S86°39'19"E	97.90'
W2-1166	S76°32'37"E	47.27'
W2-1167	S56°46'40"E	139.30'
W2-1168	S79°41'03"E	184.43'

Book
938

Pgs:
12-23

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 10 OF 21

#17.

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1169	S70°26'30"E	82.37'
W2-1170	S47°01'04"E	107.78'
W2-1171	S22°30'09"E	69.88'
W2-1172	S30°12'13"E	65.56'
W2-1173	S38°27'12"E	43.85'
W2-1174	S78°41'41"E	179.09'
W2-1175	S83°37'16"E	6.80'
W2-1176	S83°37'19"E	71.70'
W2-1177	S83°37'15"E	92.35'
W2-1178	S74°10'21"E	86.78'
W2-1179	S56°34'10"E	52.28'
W2-1180	S38°05'0[illegible]"E	275.5[illegible]'
W2-1181	S13°53'05"E	14.69'
W2-1182	S67°14'46"E	6.88'
W2-1183	S20°10'13"E	27.33'
W2-1184	S34°10'17"E	107.34'
W2-1185	S37°43'43"E	79.81'
W2-1186	S59°14'12"E	64.54'
W2-1187	S72°53'25"E	49.85'
W2-1188	N86°16'47"E	22.14'
W2-1189	N84°03'13"E	30.12'
W2-1190	N46°37'59"E	116.12'
W2-1191	N06°41'16"E	161.00'
W2-1192	N06°47'25"E	20.13'
W2-1193	N25°32'17"E	44.03'
W2-1194	N25°36'16"E	18.82'
W2-1195	N25°56'13"E	9.64'
W2-1196	N25°04'16"E	36.29'
W2-1197	N26°00'49"E	49.42'
W2-1198	N20°30'22"E	3.48'
W2-1199	N44°00'32"E	23.40'
W2-1200	N44°55'36"E	12.13'
W2-1201	N43°51'57"E	36.27'
W2-1202	N42°45'28"E	12.20'
W2-1203	N44°31'27"E	47.21'
W2-1204	N43°58'00"E	135.85'
W2-1205	S89°00'25"E	5.22'
W2-1206	N87°31'51"E	42.17'
W2-1207	N87°07'03"E	32.29'
W2-1208	N87°44'38"E	166.88'
W2-1209	S59°47'30"E	55.2[illegible]'
W2-1210	S65°54'16"E	141.06
W2-1211	S49°54'48"E	105.09'
W2-1212	S88°22'08"E	32.80'
W2-1213	S59°50'11"E	205.44'
W2-1214	S88°26'38"E	74.31'
W2-1215	S88°26'15"E	73.44'
W2-1216	N66°31'56"E	271.70'
W2-1217	N80°12'11"E	83.63'
W2-1218	N62°24'20"E	168.92'
W2-1219	N46°29'48"E	97.67'
W2-1220	N46°44'24"E	41.74'
W2-1221	N28°06'49"E	73.23'
W2-1222	N08°51'14"E	65.79'
W2-1223	N08°21'33"E	40.75'
W2-1224	N04°59'15"W	114.22'
W2-1225	N12°16'10"W	43.02'
W2-1226	N12°33'29"W	16.10'
W2-1227	N01°15'27"W	51.74'
W2-1228	N25°02'28"W	483.43'
W2-1229	N25°22'02"W	30.07'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1230	N00°34'57"W	443.29'
W2-1231	N13°58'29"W	306.79'
W2-1232	N01°25'44"E	114.70'
W2-1233	N29°23'46"W	95.82'
W2-1234	N01°36'09"E	81.93'
W2-1235	N32°17'26"W	59.24'
W2-1236	N12°29'25"W	372.18'
W2-1237	N12°27'20"W	33.69'
W2-1238	N01°34'20"E	115.06'
W2-1239	N43°46'33"W	46.16'
W2-1240	N12°37'19"W	67.81'
W2-1241	N01°36'07"E	164.22'
W2-1242	N58°20'21"E	31.72'
W2-1243	N58°53'46"E	31.52'
W2-1244	N60°38'53"E	55.49'
W2-1245	N46°09'02"E	45.44'
W2-1246	N55°41'19"E	66.15'
W2-1247	N54°16'53"E	116.94'
W2-1248	N53°07'05"E	147.08'
W2-1249	N56°01'41"E	104.83'
W2-1250	N51°31'53"E	251.50'
W2-1251	N52°20'34"E	1157.24'
W2-1252	N52°40'31"E	361.76'
W2-1253	N57°49'44"E	33.28'
W2-1254	N66°59'08"E	83.24'
W2-1255	N68°05'17"E	154.38'
W2-1256	N74°08'57"E	95.52'
W2-1257	N36°36'23"E	35.38'
W2-1258	N35°50'05"E	35.05'
W2-1259	N36°03'57"E	37.37'
W2-1260	N35°44'51"E	37.67'
W2-1261	N35°57'33"E	134.19'
W2-1262	N86°03'42"E	122.93'
W2-1263	N51°05'11"E	778.19'
W2-1264	S40°53'45"E	3.91'
W2-1265	S42°14'42"E	38.98'
W2-1266	S42°22'03"E	116.68'
W2-1267	S42°18'06"E	38.52'
W2-1268	S42°18'08"E	352.15'
W2-1269	S52°44'28"E	38.16'
W2-1270	S70°47'07"E	97.78'
W2-1271	S88°05'21"E	90.27'
W2-1272	S88°16'17"E	673.95'
W2-1273	S88°17'06"E	3581.93'
W2-1274	S72°03'08"E	44.91'
W2-1275	S04°46'34"W	13.14'
W2-1276	S04°58'56"W	1433.71'
W2-1277	S01°22'24"E	84.91'
W2-1278	N38°23'45"E	1460.62'
W2-1279	N38°23'02"E	4382.31'
W2-1280	N38°21'57"E	1460.64'
W2-1281	S50°40'19"E	897.05'
W2-1282	S50°40'14"E	2443.92'
W2-1283	N40°56'02"W	44.37'
W2-1284	S50°38'44"E	1284.85'
W2-1285	S46°53'11"E	50.41'
W2-1286	S50°44'13"E	5533.23'
W2-1287	S48°47'23"E	95.24'
W2-1288	S49°47'22"E	95.24'
W2-1289	S50°47'23"E	95.24'
W2-1290	S51°47'22"E	95.24'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1291	S53°02'25"E	142.97'
W2-1292	S53°19'25"E	64.36'
W2-1293	S54°19'26"E	64.36'
W2-1294	S55°19'26"E	64.36'
W2-1295	S56°19'25"E	64.36'
W2-1296	S57°26'46"E	74.09'
W2-1297	S65°02'06"E	118.23'
W2-1298	S80°44'28"E	141.09'
W2-1299	S80°57'33"E	131.93'
W2-1300	S89°03'05"E	389.81'
W2-1301	N84°17'39"E	229.39'
W2-1302	N84°11'27"E	63.12'
W2-1303	N65°54'28"E	49.78'
W2-1304	N64°54'29"E	63.23'
W2-1305	N63°54'29"E	63.23'
W2-1306	N62°54'28"E	63.23'
W2-1307	N61°40'52"E	91.91'
W2-1308	N63°02'29"E	45.92'
W2-1309	N62°02'29"E	45.92'
W2-1310	N61°02'29"E	45.92'
W2-1311	N60°02'28"E	45.92'
W2-1312	N59°02'29"E	45.92'
W2-1313	N58°02'31"E	45.92'
W2-1314	N57°02'29"E	45.92'
W2-1315	N56°02'29"E	45.92'
W2-1316	N55°02'28"E	17.56'
W2-1317	N01°37'35"E	26.55'
W2-1318	N56°06'13"E	1314.65'
W2-1319	N89°06'03"E	10.21'
W2-1320	N53°00'14"E	112.70'
W2-1321	N52°13'50"E	397.63'
W2-1322	N58°22'52"E	801.68'
W2-1323	N58°24'28"E	101.55'
W2-1324	N59°50'29"E	274.21'
W2-1325	N73°46'09"E	329.29'
W2-1326	N86°33'04"E	399.65'
W2-1327	N85°45'56"E	306.86'
W2-1328	N87°01'03"E	612.36'
W2-1329	N87°49'39"E	510.10'
W2-1330	N85°47'55"E	618.05'
W2-1331	N86°09'34"E	266.77'
W2-1332	N85°56'04"E	[illegible]
W2-1333	S79°59'09"E	475.25'
W2-1334	S73°58'30"E	96.49'
W2-1335	S74°05'06"E	288.72'
W2-1336	S74°43'57"E	16.18'
W2-1337	S85°21'36"E	78.82'
W2-1338	S85°30'23"E	304.75'
W2-1339	N74°30'46"E	85.02'
W2-1340	N84°45'51"E	1359.45'
W2-1341	N84°45'19"E	3625.28'
W2-1342	N84°46'09"E	397.57'
W2-1343	N84°45'50"E	397.28'
W2-1344	N84°44'25"E	321.40'
W2-1345	N84°14'22"E	43.83'
W2-1346	N84°27'37"E	459.72'
W2-1347	N84°18'57"E	139.36'
W2-1348	S89°05'00"E	174.13'
W2-1349	N76°49'50"E	149.61'
W2-1350	S37°38'28"E	93.12'
W2-1351	S68°10'48"E	301.04'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1352	S52°52'37"E	428.38'
W2-1353	S42°29'18"E	564.30'
W2-1354	S39°44'37"E	136.31'
W2-1355	S68°42'02"E	1001.33'
W2-1356	S68°43'13"E	2868.14'
W2-1357	S68°30'37"E	48.68'
W2-1358	S85°03'40"E	274.38'
W2-1359	S85°29'15"E	173.62'
W2-1360	S85°30'36"E	989.64'
W2-1361	N68°08'32"E	71.58'
W2-1362	N04°22'08"E	126.09'
W2-1363	S84°14'53"E	100.03'
W2-1364	S84°14'36"E	3[illegible]3.25'
W2-1365	N76°06'55"E	773.69'
W2-1366	N77°12'37"E	686.17'
W2-1367	N59°56'30"E	139.44'
W2-1368	N60°10'38"E	12.83'
W2-1369	N69°17'01"E	315.31'
W2-1370	N70°43'19"E	344.15'
W2-1371	N77°35'55"E	535.03'
W2-1372	N85°30'34"E	416.36'
W2-1373	N60°15'08"E	9.38'
W2-1374	N68°18'10"E	9.35'
W2-1375	N68°23'14"E	9.37'
W2-1376	N76°34'33"E	388.53'
W2-1377	N76°35'20"E	36.50'
W2-1378	S87°57'05"E	209.56'
W2-1379	S81°09'28"E	224.01'
W2-1380	N85°30'34"E	123.34'
W2-1381	S75°32'38"E	15.52'
W2-1382	S75°54'34"E	488.00'
W2-1383	S70°22'31"E	531.73'
W2-1384	S69°05'47"E	95.76'
W2-1385	S69°12'32"E	62.04'
W2-1386	S62°01'02"E	105.92'
W2-1387	S72°50'15"E	59.21'
W2-1388	S67°13'56"E	293.02'
W2-1389	N89°26'46"E	780.07'
W2-1390	S03°28'03"E	167.41'
W2-1391	S78°51'52"W	212.76'
W2-1392	S84°55'32"E	134.82'
W2-1393	S84°55'34"E	428.35'
W2-1394	N85°01'34"E	137.83'
W2-1395	N74°03'05"E	59.29'
W2-1396	N74°02'38"E	136.29'
W2-1397	N60°43'51"E	199.54'
W2-1398	N60°43'25"E	87.76'
W2-1399	N55°16'43"E	77.04'
W2-1400	N51°16'47"E	91.26'
W2-1401	N47°17'00"E	91.26'
W2-1402	N44°40'41"E	27.25'
W2-1403	N42°05'27"E	91.26'
W2-1404	N38°05'14"E	91.26'
W2-1405	N34°05'26"E	91.26'
W2-1406	N30°05'02"E	91.27'
W2-1407	N26°04'59"E	91.26'
W2-1408	N28°13'47"E	5.13'
W2-1409	N25°52'37"E	37.23'
W2-1410	N21°52'06"E	37.23'
W2-1411	N17°53'29"E	37.24'
W2-1412	N13°52'07"E	37.24'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1413	N09°53'10"E	37.23'
W2-1414	N05°52'11"E	37.24'
W2-1415	N01°53'56"E	37.23'
W2-1416	N02°07'44"W	30.74'
W2-1417	N09°55'44"W	12.41'
W2-1418	N11°02'46"W	13.76'
W2-1419	N12°02'48"W	13.76'
W2-1420	N13°02'45"W	13.76'
W2-1421	N14°02'47"W	13.76'
W2-1422	N15°02'46"W	13.76'
W2-1423	N16°02'46"W	13.76'
W2-1424	N17°02'44"W	13.76'
W2-1425	N18°02'49"W	13.76'
W2-1426	N19°02'45"W	13.76'
W2-1427	N20°02'47"W	13.76'
W2-1428	N21°02'46"W	13.76'
W2-1429	N22°02'42"W	13.76'
W2-1430	N23°02'48"W	13.76'
W2-1431	N24°02'50"W	13.76'
W2-1432	N25°02'45"W	13.76'
W2-1433	N26°02'44"W	13.76'
W2-1434	N29°53'06"W	30.71'
W2-1435	N28°39'53"W	21.35'
W2-1436	N27°39'57"W	21.35'
W2-1437	N26°39'56"W	21.35'
W2-1438	N25°39'56"W	21.35'
W2-1439	N24°39'56"W	21.35'
W2-1440	N23°39'56"W	21.35'
W2-1441	N22°39'57"W	21.35'
W2-1442	N21°39'55"W	21.35'
W2-1443	N20°39'55"W	21.35'
W2-1444	N19°39'56"W	21.35'
W2-1445	N20°44'02"W	43.03'
W2-1446	N19°24'21"W	25.98'
W2-1447	N18°24'20"W	25.98'
W2-1448	N17°24'23"W	25.98'
W2-1449	N16°24'19"W	25.98'
W2-1450	N15°24'23"W	25.98'
W2-1451	N10°54'33"W	278.16'
W2-1452	N08°03'02"W	10.60'
W2-1453	N07°02'09"W	10.28'
W2-1454	N06°02'[illegible]"W	[illegible]
W2-1455	N05°02'09"W	7.93'
W2-1456	N10°50'19"W	0.74'
W2-1457	N06°19'33"W	19.21'
W2-1458	N03°06'41"W	31.63'
W2-1459	N00°52'32"E	31.63'
W2-1460	N04°52'50"E	31.64'
W2-1461	N08°54'41"E	31.63'
W2-1462	N12°51'52"E	31.63'
W2-1463	N16°53'34"E	31.63'
W2-1464	N20°51'55"E	31.63'
W2-1465	N23°14'36"E	64.45'
W2-1466	N19°36'26"E	79.34'
W2-1467	N15°36'21"E	79.33'
W2-1468	N16°25'06"E	14.00'
W2-1469	N19°05'34"E	40.61'
W2-1470	N23°05'32"E	40.60'
W2-1471	N27°06'04"E	40.63'
W2-1472	N33°51'21"E	96.62'
W2-1473	N40°36'23"E	40.61'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1474	N44°37'02"E	40.60'
W2-1475	N48°37'07"E	40.62'
W2-1476	N52°37'45"E	40.61'
W2-1477	N50°31'23"E	0.18'
W2-1478	N54°59'11"E	21.81'
W2-1479	N58°59'46"E	24.46'
W2-1480	N62°59'52"E	24.45'
W2-1481	N66°59'02"E	8.25'
W2-1482	N67°01'58"E	16.21'
W2-1483	N71°11'30"E	2.40'
W2-1484	N70°59'19"E	19.65'
W2-1485	N74°59'17"E	24.45'
W2-1486	N79°00'55"E	24.45'
W2-1487	N82°59'46"E	24.47'
W2-1488	N87°00'43"E	24.46'
W2-1489	S89°00'15"E	24.45'
W2-1490	S84°58'57"E	6.29'
W2-1491	S84°58'21"E	18.16'
W2-1492	S81°01'37"E	4.65'
W2-1493	S80°58'12"E	19.80'
W2-1494	S76°58'38"E	10.50'
W2-1495	S77°01'35"E	13.96'
W2-1496	S74°20'28"E	0.22'
W2-1497	S72°59'30"E	23.93'
W2-1498	S88°28'45"E	33.85'
W2-1499	S47°51'58"E	46.64'
W2-1500	S56°58'14"E	22.37'
W2-1501	S52°59'37"E	24.45'
W2-1502	S42°05'54"E	16.64'
W2-1503	S39°06'59"E	26.64'
W2-1504	S47°51'58"E	15.33'
W2-1505	S30°30'59"E	154.85'
W2-1506	S10°57'02"E	151.41'
W2-1507	S01°31'43"W	180.61'
W2-1508	S32°36'54"W	95.46'
W2-1509	S01°30'44"W	397.26'
W2-1510	S01°31'07"W	78.65'
W2-1511	S16°53'30"E	103.62'
W2-1512	S43°25'29"E	185.72'
W2-1513	S65°10'33"E	97.80'
W2-1514	S50°57'52"E	11.31'
W2-1515	S75°38'29"E	5.73'
W2-1516	S79°38'40"E	34.82'
W2-1517	S83°39'19"E	34.84'
W2-1518	S87°39'19"E	34.83'
W2-1519	N88°21'19"E	34.84'
W2-1520	N84°21'26"E	34.84'
W2-1521	N80°20'47"E	34.83'
W2-1522	N81°03'30"E	31.52'
W2-1523	N84°42'20"E	38.11'
W2-1524	N88°43'18"E	38.10'
W2-1525	S87°17'33"E	38.11'
W2-1526	S83°17'36"E	38.10'
W2-1527	S79°17'14"E	38.11'
W2-1528	S75°17'31"E	38.11'
W2-1529	S71°17'30"E	38.11'
W2-1530	S67°16'55"E	38.11'
W2-1531	S63°17'42"E	38.11'
W2-1532	S59°17'24"E	38.10'
W2-1533	S55°17'17"E	38.11'
W2-1534	S51°17'07"E	38.11'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1535	S47°17'11"E	38.11'
W2-1536	S43°17'55"E	38.11'
W2-1537	S39°16'34"E	38.11'
W2-1538	S35°17'56"E	38.12'
W2-1539	S31°17'03"E	38.10'
W2-1540	S27°17'26"E	33.26'
W2-1541	S27°18'50"E	4.85'
W2-1542	S23°17'41"E	9.08'
W2-1543	S23°17'16"E	14.92'
W2-1544	S23°11'52"E	7.04'
W2-1545	S22°02'37"E	2.18'
W2-1546	S22°01'56"E	8.44'
W2-1547	S19°16'[illegible]"E	16.34'
W2-1548	S30°18'45"E	9.87'
W2-1549	S07°58'44"E	10.17'
W2-1550	S15°17'30"E	36.66'
W2-1551	S11°16'57"E	27.64'
W2-1552	S08°54'31"E	25.94'
W2-1553	S03°17'57"E	23.55'
W2-1554	S19°21'07"E	213.36'
W2-1555	S19°19'00"E	131.13'
W2-1556	S43°28'18"E	211.32'
W2-1557	S43°25'06"E	113.45'
W2-1558	S70°04'32"E	103.78'
W2-1559	N76°32'02"E	61.71'
W2-1560	N76°45'33"E	110.43'
W2-1561	N76°36'46"E	110.81'
W2-1562	N77°31'45"E	22.07'
W2-1563	N76°39'37"E	420.97'
W2-1564	N83°37'11"E	132.54'
W2-1565	S62°17'43"E	209.78'
W2-1566	S55°55'16"E	136.32'
W2-1567	S04°48'41"E	32.20'
W2-1568	S04°17'25"E	51.55'
W2-1569	S04°10'58"E	32.90'
W2-1570	S04°35'06"E	9.14'
W2-1571	S22°36'33"W	209.31'
W2-1572	S22°36'32"W	32.14'
W2-1573	S22°22'19"W	32.48'
W2-1574	S08°16'28"E	34.67'
W2-1575	S05°16'10"E	94.85'
W2-1576	[illegible]	55.43'
W2-1577	S40°43'03"E	85.69'
W2-1578	S49°04'50"E	79.24'
W2-1579	S67°39'54"E	165.70'
W2-1580	S80°02'32"E	65.20'
W2-1581	S87°34'44"E	11.02'
W2-1582	S88°28'01"E	203.32'
W2-1583	S88°55'33"E	195.49'
W2-1584	N79°12'00"E	57.17'
W2-1585	N54°20'17"W	85.52'
W2-1586	N54°14'57"W	57.31'
W2-1587	N54°07'01"W	57.76'
W2-1588	N54°17'27"W	45.26'
W2-1589	N83°33'26"W	90.11'
W2-1590	N70°17'22"E	219.51'
W2-1591	N87°48'30"E	170.04'
W2-1592	S78°45'55"E	44.55'
W2-1593	S78°59'05"E	136.51'
W2-1594	S38°12'09"E	125.23'
W2-1595	S00°52'34"W	84.11'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1596	S11°38'16"E	95.11'
W2-1597	S21°13'46"W	218.64'
W2-1598	S00°58'06"E	180.33'
W2-1599	S24°59'02"W	107.30'
W2-1600	S06°29'01"E	158.60'
W2-1601	S07°53'16"E	78.10'
W2-1602	S32°50'05"E	120.81'
W2-1603	S03°35'09"E	190.28'
W2-1604	S69°14'17"W	36.53'
W2-1605	S69°52'09"W	198.06'
W2-1606	S69°37'59"W	97.47'
W2-1607	S69°46'17"W	97.07'
W2-1608	S69°50'08"W	23.32'
W2-1609	S69°34'38"W	23.05'
W2-1610	S30°58'51"W	32.41'
W2-1611	S13°06'37"W	224.66'
W2-1612	S01°48'08"W	143.84'
W2-1613	S02°36'09"W	144.62'
W2-1614	S35°04'55"E	134.95'
W2-1615	N74°33'31"E	137.01'
W2-1616	N51°28'09"E	2.91'
W2-1617	N51°03'43"E	25.95'
W2-1618	N50°48'24"E	70.30'
W2-1619	N50°48'32"E	25.54'
W2-1620	N41°48'25"E	10.32'
W2-1621	N40°48'25"E	11.89'
W2-1622	N39°48'20"E	11.89'
W2-1623	N34°57'24"E	22.46'
W2-1624	N36°21'57"E	12.35'
W2-1625	N37°21'53"E	12.35'
W2-1626	N38°21'57"E	12.35'
W2-1627	N39°21'56"E	12.35'
W2-1628	N40°22'01"E	12.35'
W2-1629	N41°21'54"E	12.35'
W2-1630	N42°21'54"E	12.35'
W2-1631	N43°21'59"E	12.35'
W2-1632	N44°21'55"E	12.35'
W2-1633	N45°21'57"E	12.35'
W2-1634	N46°22'00"E	12.35'
W2-1635	N47°21'57"E	12.35'
W2-1636	N48°21'56"E	12.35'
W2-1637	N49°21'58"E	12.35'
W2-1638	N50°21'59"E	12.35
W2-1639	N51°22'00"E	10.53'
W2-1640	N49°47'24"E	61.24'
W2-1641	N55°49'48"E	49.96'
W2-1642	N55°49'55"E	39.88'
W2-1643	N55°49'53"E	9.78'
W2-1644	N46°16'22"E	120.77'
W2-1645	N58°21'56"E	85.36'
W2-1646	N58°05'16"E	51.10'
W2-1647	N74°55'33"E	39.08'
W2-1648	N52°52'45"E	0.13'
W2-1649	N57°16'32"E	28.25'
W2-1650	N61°40'16"E	28.25'
W2-1651	N66°04'05"E	28.25'
W2-1652	N70°27'49"E	28.25'
W2-1653	N74°51'36"E	28.25'
W2-1654	N79°15'22"E	28.25'
W2-1655	N83°39'09"E	28.25'
W2-1656	N88°02'55"E	28.25'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1657	S82°38'34"E	22.51'
W2-1658	S76°48'26"E	15.73
W2-1659	N49°13'53"E	38.07'
W2-1660	N49°17'35"E	47.73'
W2-1661	N49°11'53"E	48.19'
W2-1662	N49°23'59"E	74.77'
W2-1663	N48°58'45"E	64.34'
W2-1664	S61°14'36"E	48.27'
W2-1665	S73°36'20"E	39.46'
W2-1666	S63°52'51"E	45.25
W2-1667	S54°51'36"E	81.48'
W2-1668	S42°01'47"E	98.92'
W2-1669	S19°02'40"E	85.20
W2-1670	S11°04'25"E	60.29'
W2-1671	S01°24'30"W	62.26'
W2-1672	S11°04'42"W	34.41'
W2-1673	S16°18'03"W	58.92'
W2-1674	S23°24'10"W	48.48'
W2-1675	S23°39'18"W	125.19'
W2-1676	S23°38'10"W	52.52'
W2-1677	S23°28'59"W	52.85'
W2-1678	S23°49'40"W	25.31
W2-1679	S23°53'59"E	7.62'
W2-1680	S22°18'11"E	14.19'
W2-1681	S68°40'01"E	70.58'
W2-1682	S67°55'53"E	129.58
W2-1683	N57°37'30"E	51.96'
W2-1684	N64°52'08"E	11.63'
W2-1685	N64°43'48"E	22.31'
W2-1686	N63°24'49"E	22.90
W2-1687	S83°52'56"E	11.95
W2-1688	S85°42'31"E	30.53'
W2-1689	S32°45'11"E	79.15'
W2-1690	S32°20'38"E	12.19
W2-1691	S35°03'41"E	4.95'
W2-1692	S35°25'50"E	69.13'
W2-1693	S20°07'29"E	10.53'
W2-1694	S19°12'39"E	1.15'
W2-1695	S66°27'38"E	58.05'
W2-1696	S65°43'30"E	147.16'
W2-1697	S64°59'23"E	147.16
W2-1698	N73°36'5[illegible]"E	71.99'
W2-1699	N7[illegible]°39'57"E	71.99
W2-1700	N69°43'02"E	71.99
W2-1701	N67°46'06"E	71.99'
W2-1702	N65°49'11"E	71.99'
W2-1703	N63°52'18"E	71.99'
W2-1704	N61°55'21"E	71.99

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1705	N59°58'27"E	71.99'
W2-1706	N58°01'32"E	71.99'
W2-1707	N56°04'37"E	71.99'
W2-1708	N54°07'42"E	71.99'
W2-1709	N52°10'48"E	71.99'
W2-1710	N50°13'53"E	71.99'
W2-1711	S05°32'35"E	38.32'
W2-1712	N57°03'01"E	64.58'
W2-1713	N56°48'20"E	430.98'
W2-1714	N56°47'56"E	720.79'
W2-1715	N57°38'24"E	31.23'
W2-1716	N56°51'52"E	551.45'
W2-1717	N57°36'48"E	30.54'
W2-1718	N59°23'21"E	57.18'
W2-1719	N58°54'38"E	252.47'
W2-1720	N60°28'36"E	186.41'
W2-1721	N61°32'38"E	156.13'
W2-1722	N57°18'35"E	157.43'
W2-1723	N60°39'36"E	163.56'
W2-1724	N58°46'06"E	169.25'
W2-1725	N58°18'21"E	152.90'
W2-1726	N56°16'42"E	99.42'
W2-1727	N60°12'52"E	177.12'
W2-1728	N59°27'38"E	216.62'
W2-1729	N60°32'14"E	379.30'
W2-1730	N24°26'54"W	302.08'
W2-1731	N67°38'45"E	685.31'
W2-1732	N57°59'22"E	11.40'
W2-1733	N84°36'26"E	60.15'
W2-1734	N84°15'26"E	56.97'
W2-1735	N85°00'54"E	42.89'
W2-1736	N67°40'47"E	144.29'
W2-1737	N70°54'10"E	11.73'
W2-1738	N63°33'22"E	158.74'
W2-1739	N76°34'24"E	39.83'
W2-1740	N63°12'19"E	25.89'
W2-1741	S17°35'56"E	44.91'
W2-1742	S17°33'46"E	25.71'
W2-1743	N70°14'15"E	6.20'
W2-1744	N68°46'15"E	21.30'
W2-1745	N68°41'58"E	48.26'
W2-1746	N07°01'49"W	16.91'
W2-1747	N07°3[illegible]'03"W	33.86'
W2-1748	N06°26'53"W	31.94'
W2-1749	N64°05'42"E	31.53'
W2-1750	N57°36'19"E	61.08'
W2-1751	N75°01'33"E	34.69'
W2-1752	N74°03'25"E	16.37'

Book
938

Pgs:
13-23

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 11 OF 21

#13.

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1753	N74°54'21"E	88.75'
W2-1754	N71°38'56"E	5.53'
W2-1755	N72°01'21"E	108.25'
W2-1756	N64°40'01"E	155.90'
W2-1757	N64°20'08"E	90.50'
W2-1758	N79°34'25"E	13.02'
W2-1759	N77°23'46"E	39.09'
W2-1760	N77°43'22"E	12.82'
W2-1761	N75°04'26"E	21.41'
W2-1762	N74°13'45"E	63.61'
W2-1763	N73°54'55"E	21.24'
W2-1764	N73°20'18"E	45.96'
W2-1765	N72°54'10"E	36.61'
W2-1766	N71°20'17"E	14.16'
W2-1767	N76°46'28"E	4.49'
W2-1768	N73°03'59"E	13.11'
W2-1769	N73°48'16"E	69.52'
W2-1770	N73°13'42"E	45.68'
W2-1771	N73°58'07"E	47.62'
W2-1772	N73°32'04"E	56.24'
W2-1773	N78°00'36"E	72.04'
W2-1774	S89°08'28"E	13.35'
W2-1775	S89°08'27"E	46.44'
W2-1776	S81°27'30"E	27.24'
W2-1777	S81°34'01"E	63.53'
W2-1778	N88°30'14"E	17.72'
W2-1779	N86°57'29"E	26.76'
W2-1780	N87°37'56"E	6.37'
W2-1781	N87°37'56"E	19.50'
W2-1782	N71°08'19"E	60.43'
W2-1783	N70°49'55"E	45.72'
W2-1784	N70°32'16"E	51.38'
W2-1785	N76°48'01"E	148.40'
W2-1786	N73°48'33"E	13.66'
W2-1787	N73°31'12"E	65.98'
W2-1788	N61°33'19"E	25.29'
W2-1789	N61°39'33"E	73.14'
W2-1790	N57°59'25"E	80.51'
W2-1791	N56°14'22"E	140.36'
W2-1792	N65°34'22"E	79.28'
W2-1793	N58°45'28"E	82.22'
W2-1794	N72°22'27"E	86.44'
W2-1795	N79°44'06"E	103.82'
W2-1796	N73°12'34"E	85.28'
W2-1797	N44°37'37"E	54.96'
W2-1798	N32°24'47"E	255.09'
W2-1799	N29°41'53"E	45.72'
W2-1800	N58°13'20"E	33.08'
W2-1801	N69°35'46"E	49.20'
W2-1802	N51°58'08"E	5.22'
W2-1803	N53°38'16"E	67.42'
W2-1804	N60°35'50"E	67.20'
W2-1805	N79°27'07"E	92.08'
W2-1806	N86°26'48"E	104.21'
W2-1807	N78°49'43"E	47.18'
W2-1808	N71°54'03"E	54.93'
W2-1809	N53°49'05"E	50.17'
W2-1810	N62°46'53"E	68.09'
W2-1811	N83°48'13"E	62.29'
W2-1812	N77°06'28"E	59.76'
W2-1813	N73°05'35"E	71.61'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1814	N76°47'20"E	197.76'
W2-1815	N83°34'12"E	109.13'
W2-1816	N82°28'59"E	95.04'
W2-1817	N85°38'44"E	68.19'
W2-1818	N82°06'13"E	78.99'
W2-1819	N88°55'18"E	54.01'
W2-1820	S87°01'20"E	108.04'
W2-1821	N87°59'25"E	80.20'
W2-1822	N80°50'25"E	138.22'
W2-1823	S02°11'02"W	1324.21'
W2-1824	S11°21'41"W	708.04'
W2-1825	S07°38'58"E	606.11'
W2-1826	S34°24'19"E	1806.22'
W2-1827	S42°39'37"E	543.89'
W2-1828	S33°18'13"E	1705.18'
W2-1829	S49°21'03"E	1944.17'
W2-1830	S41°46'27"E	694.57'
W2-1831	S34°04'20"E	924.32'
W2-1832	S53°11'11"E	293.26'
W2-1833	S33°49'08"W	174.40'
W2-1834	S13°20'46"W	568.42'
W2-1835	S13°12'08"E	707.53'
W2-1836	S39°31'33"E	412.20'
W2-1837	S73°27'14"E	465.18'
W2-1838	S55°13'22"E	229.71'
W2-1839	S30°49'23"E	260.15'
W2-1840	S60°46'36"E	407.40'
W2-1841	S21°09'44"E	661.00'
W2-1842	S41°26'28"E	526.46'
W2-1843	S66°09'26"E	819.49'
W2-1844	S14°42'08"E	1746.47'
W2-1845	S09°21'56"E	635.60'
W2-1846	S31°23'16"E	201.35'
W2-1847	S14°17'08"W	369.68'
W2-1848	S13°32'01"E	1236.37'
W2-1849	S47°39'35"E	454.39'
W2-1850	S74°10'34"E	218.67'
W2-1851	S09°48'42"E	103.19'
W2-1852	S29°56'36"E	388.15'
W2-1853	S57°57'12"E	1169.22'
W2-1854	S89°50'21"E	259.01'
W2-1855	[illegible]	[illegible]
W2-1856	S39°49'50"E	485.50'
W2-1857	S27°44'19"E	598.28'
W2-1858	S10°49'39"E	587.82'
W2-1859	S30°55'23"E	713.78'
W2-1860	S40°10'36"E	594.17'
W2-1861	S59°49'19"E	769.02'
W2-1862	S44°22'37"E	392.87'
W2-1863	S65°57'13"E	241.05'
W2-1864	S25°05'28"W	157.86'
W2-1865	S00°25'48"W	273.79'
W2-1866	S27°26'41"E	407.68'
W2-1867	S08°39'31"W	266.36'
W2-1868	S15°17'26"E	249.68'
W2-1869	S25°31'41"W	327.50'
W2-1870	S01°08'15"W	727.70'
W2-1871	S24°57'30"E	607.34'
W2-1872	S43°52'03"E	674.59'
W2-1873	S67°32'36"E	561.23'
W2-1874	S17°05'06"E	322.43'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1875	S34°04'07"E	357.34'
W2-1876	S61°24'28"E	925.82'
W2-1877	S37°49'49"E	480.05'
W2-1878	S73°00'53"E	714.96'
W2-1879	S52°00'43"E	253.42'
W2-1880	S78°31'20"E	292.88'
W2-1881	N70°01'05"E	715.21'
W2-1882	N26°21'44"E	311.75'
W2-1883	N56°34'23"E	382.32'
W2-1884	S12°32'11"W	235.75'
W2-1885	S11°38'59"E	412.99'
W2-1886	S43°16'12"E	352.76'
W2-1887	S20°10'16"E	608.01'
W2-1888	S34°01'24"E	474.47'
W2-1889	S53°29'16"E	555.48'
W2-1890	S40°37'25"E	903.90'
W2-1891	S64°03'03"E	823.86'
W2-1892	S07°15'08"E	1851.78'
W2-1893	S05°57'11"W	1016.39'
W2-1894	S27°48'36"W	362.71'
W2-1895	S14°30'18"E	408.05'
W2-1896	S00°36'03"E	417.35'
W2-1897	S21°31'36"E	511.76'
W2-1898	S43°18'04"E	243.41'
W2-1899	S65°04'32"E	810.36'
W2-1900	S18°17'27"E	1451.69'
W2-1901	S24°09'01"W	290.17'
W2-1902	S05°19'06"W	539.35'
W2-1903	S07°12'36"E	1908.57'
W2-1904	S17°51'47"E	365.66'
W2-1905	S36°16'12"E	1088.43'
W2-1906	S53°06'08"E	1576.16'
W2-1907	S74°39'09"E	3203.25'
W2-1908	S88°17'42"E	784.09'
W2-1909	N72°23'40"E	381.18'
W2-1910	S47°48'33"E	213.82'
W2-1911	S24°54'24"W	801.93'
W2-1912	S02°58'43"E	545.70'
W2-1913	S46°25'35"E	579.19'
W2-1914	S31°45'05"E	362.93'
W2-1915	S08°35'04"W	120.99'
W2-1916	[illegible]	[illegible]
W2-1917	S01°36'15"E	558.19'
W2-1918	S35°28'55"W	739.84'
W2-1919	S06°41'40"W	450.85'
W2-1920	S62°15'24"W	556.38'
W2-1921	S24°57'56"W	329.27'
W2-1922	S01°33'31"E	400.61'
W2-1923	S23°16'01"E	990.73'
W2-1924	S23°16'01"E	81.58'
W2-1925	N75°41'26"E	1045.88'
W2-1926	S67°34'17"W	394.86'
W2-1927	S54°04'10"E	735.22'
W2-1928	S19°02'02"W	335.38'
W2-1929	S31°16'51"E	636.69'
W2-1930	S54°36'22"E	485.25'
W2-1931	S79°44'38"E	587.66'
W2-1932	N48°11'10"E	246.23'
W2-1933	N08°58'23"E	342.87'
W2-1934	N20°14'45"W	439.60'
W2-1935	N63°07'27"E	253.16'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1936	N38°17'48"E	286.06
W2-1937	N88°41'48"E	248.48'
W2-1938	S21°48'21"E	423.16'
W2-1939	S52°52'01"E	653.33
W2-1940	N88°33'53"E	532.72'
W2-1941	S59°26'40"E	560.52'
W2-1942	N87°34'47"E	543.52'
W2-1943	N36°48'24"E	328.85'
W2-1944	S47°25'04"E	680.88
W2-1945	S52°44'01"E	430.01'
W2-1946	S75°56'55"E	174.85'
W2-1947	S75°56'44"E	218.46
W2-1948	N78°40'09"E	352.74
W2-1949	S62°06'13"E	580.36'
W2-1950	S04°53'32"W	512.42'
W2-1951	S14°54'00"E	222.18'
W2-1952	S34°41'31"E	255.21'
W2-1953	S34°41'31"E	133.88'
W2-1954	S05°43'21"E	204.69'
W2-1955	S23°53'21"E	204.58'
W2-1956	S42°03'21"E	275.57
W2-1957	S06°05'40"E	257.07'
W2-1958	S36°43'28"E	253.31'
W2-1959	S32°53'55"W	454.48'
W2-1960	S14°25'26"E	501.54'
W2-1961	S39°14'45"E	425.35'
W2-1962	S71°21'02"E	344.95'
W2-1963	N84°18'10"E	348.99
W2-1964	S24°24'09"E	1029.64'
W2-1965	S80°14'25"W	373.13'
W2-1966	S23°58'32"W	325.00
W2-1967	S29°45'59"E	552.23'
W2-1968	S60°28'52"E	717.73'
W2-1969	N83°28'02"E	353.15
W2-1970	S24°46'39"E	54.80'
W2-1971	N70°41'41"E	141.92'
W2-1972	S17°10'44"E	260.08'
W2-1973	S30°09'21"E	147.66'
W2-1974	S51°23'29"E	1076.97
W2-1975	S66°25'45"E	343.18'
W2-1976	S86°24'00"E	298.38'
W2-1977	[illegible]	[illegible]
W2-1978	S17°39'24"W	99.56
W2-1979	S01°32'40"W	268.18'
W2-1980	S17°32'22"E	566.23'
W2-1981	S07°23'34"E	476.33
W2-1982	S26°56'58"E	176.45
W2-1983	S51°02'20"E	503.76'
W2-1984	S70°05'33"E	524.34
W2-1985	S28°38'51"E	234.79'
W2-1986	S06°46'32"E	243.31'
W2-1987	S36°09'37"E	274.41
W2-1988	S27°02'54"W	307.15'
W2-1989	S02°18'45"E	262.34'
W2-1990	S41°57'29"E	475.04'
W2-1991	S37°35'42"W	244.61'
W2-1992	N83°32'07"W	498.81'
W2-1993	S73°30'30"W	931.65'
W2-1994	S62°51'16"W	849.07
W2-1995	S84°22'08"W	375.57'
W2-1996	N64°56'07"E	261.97'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1997	N39°20'17"E	186.16'
W2-1998	N22°51'24"E	368.14
W2-1999	N09°32'20"E	151.15
W2-2000	N19°33'47"W	178.49'
W2-2001	N42°49'10"W	363.48'
W2-2002	N66°29'06"W	301.97
W2-2003	N51°54'04"W	493.58'
W2-2004	N77°28'32"W	283.26'
W2-2005	S76°57'00"W	272.69'
W2-2006	N49°08'19"W	209.01'
W2-2007	N75°20'10"W	300.66
W2-2008	S64°13'36"W	333.89'
W2-2009	S38°52'54"W	287.80
W2-2010	N85°07'21"W	231.59'
W2-2011	S75°09'34"W	1010.45'
W2-2012	S53°39'03"W	227.42'
W2-2013	S13°46'44"W	220.03'
W2-2014	S30°49'50"E	277.48'
W2-2015	S55°50'50"E	2851.23'
W2-2016	S51°34'28"E	1224.88'
W2-2017	S67°48'40"E	184.77
W2-2018	S84°09'57"E	580.04
W2-2019	S71°59'11"E	436.37'
W2-2020	N73°53'49"E	216.45'
W2-2021	S21°50'30"E	311.87
W2-2022	S67°44'09"E	836.04'
W2-2023	S74°01'50"E	1073.14'
W2-2024	N88°36'48"E	569.94
W2-2025	N65°56'26"E	319.04
W2-2026	S82°41'30"E	186.64'
W2-2027	N80°45'57"E	172.19'
W2-2028	S69°30'01"E	413.47
W2-2029	S45°32'10"E	385.57'
W2-2030	S02°17'03"E	170.16'
W2-2031	S31°09'11"W	366.59
W2-2032	S00°07'06"E	376.32'
W2-2033	S31°33'51"E	277.21'
W2-2034	S64°47'45"W	214.46
W2-2035	S87°54'53"W	384.91'
W2-2036	S51°06'08"W	264.15'
W2-2037	S06°51'32"W	229.84
W2-2038	[illegible]	[illegible]
W2-2039	S29°29'06"E	50.42'
W2-2040	S24°30'19"E	54.53'
W2-2041	S26°53'51"E	70.66
W2-2042	S14°33'50"E	161.44
W2-2043	S05°28'12"E	41.71'
W2-2044	S32°06'34"W	185.67
W2-2045	S52°42'07"W	46.48
W2-2046	S51°43'05"W	35.90'
W2-2047	S52°53'42"W	72.37'
W2-2048	S52°58'32"W	77.93
W2-2049	S20°42'49"W	249.91'
W2-2050	S23°52'45"W	14.67'
W2-2051	S20°53'21"W	68.22
W2-2052	S16°55'35"W	45.52'
W2-2053	S22°10'02"W	141.05'
W2-2054	S20°53'21"W	415.26'
W2-2055	S03°01'04"E	991.87'
W2-2056	S31°49'54"E	856.27
W2-2057	S12°16'11"E	453.92'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-2058	S17°14'17"W	352.95'
W2-2059	S49°05'36"W	1311.61'
W2-2060	S28°44'34"W	227.90'
W2-2061	N81°46'39"W	290.16'
W2-2062	N52°54'34"W	368.40'
W2-2063	N81°09'04"W	477.62'
W2-2064	N24°14'23"W	502.63'
W2-2065	N51°47'02"E	461.31'
W2-2066	N02°57'11"E	328.70'
W2-2067	N53°33'19"W	421.32'
W2-2068	N35°20'51"W	637.17'
W2-2069	N57°33'56"W	662.43'
W2-2070	N19°01'41"W	355.29'
W2-2071	N44°48'23"W	453.82'
W2-2072	N28°43'07"W	1032.39'
W2-2073	N45°09'26"W	905.93'
W2-2074	N36°56'49"W	1167.40'
W2-2075	N50°28'15"W	2680.72'
W2-2076	N64°16'52"W	1379.58'
W2-2077	N86°51'29"W	536.84'
W2-2078	S49°46'31"W	352.46'
W2-2079	N58°29'31"W	74.44'
W2-2080	N20°47'41"W	810.20'
W2-2081	N50°17'34"W	3907.27'
W2-2082	S84°22'25"W	227.78'
W2-2083	N37°30'00"W	468.43'
W2-2084	N61°50'57"W	1650.17'
W2-2085	S74°52'59"W	280.17'
W2-2086	N62°35'19"W	605.52'
W2-2087	N84°34'55"W	509.52'
W2-2088	N37°12'29"W	867.14'
W2-2089	N55°24'20"W	209.91'
W2-2090	S85°17'57"W	543.54'
W2-2091	N62°05'32"W	355.41'
W2-2092	S78°08'02"W	330.29'
W2-2093	S44°38'50"W	370.58'
W2-2094	S02°08'52"W	608.05'
W2-2095	S24°38'34"E	474.37'
W2-2096	S16°45'21"W	706.33'
W2-2097	S13°49'02"E	583.79'
W2-2098	S40°47'08"E	353.37'
W2-2099	[illegible]	[illegible]
W2-2100	S46°15'39"E	1606.31'
W2-2101	N65°57'55"W	466.97'
W2-2102	N87°03'47"W	559.63'
W2-2103	N65°04'35"W	647.17'
W2-2104	S71°25'16"W	1339.80'
W2-2105	S33°39'31"W	627.34'
W2-2106	N74°42'48"W	195.94'
W2-2107	N89°21'16"W	1107.69'
W2-2108	N66°06'13"W	862.17'
W2-2109	S88°13'24"W	205.66'
W2-2110	S49°51'18"W	522.04'
W2-2111	S03°17'58"W	272.61'
W2-2112	S37°10'19"E	1407.29'
W2-2113	S40°21'42"W	243.53'
W2-2114	S12°23'03"W	367.36'
W2-2115	S09°30'02"E	155.52'
W2-2116	S31°44'34"E	967.13'
W2-2117	S02°25'05"W	667.43'
W2-2118	N67°04'25"W	400.79'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-2119	S76°36'34"W	231.37'
W2-2120	S49°46'42"W	231.86'
W2-2121	S09°49'39"W	328.12'
W2-2122	S12°24'15"E	193.17'
W2-2123	S45°35'30"E	543.07'
W2-2124	S34°05'43"E	1173.84'
W2-2125	S65°05'16"E	903.54'
W2-2126	S28°57'37"E	344.41'
W2-2127	S40°16'15"E	897.41'
W2-2128	S65°34'29"E	459.88'
W2-2129	S38°07'00"E	275.45'
W2-2130	S87°47'08"W	314.39'
W2-2131	S68°49'09"W	384.92
W2-2132	N26°46'05"W	777.38'
W2-2133	N56°07'49"W	563.56'
W2-2134	S87°52'02"W	501.49'
W2-2135	S70°44'50"W	449.64'
W2-2136	N85°55'11"W	264.51'
W2-2137	S52°12'28"W	771.59'
W2-2138	S83°09'43"W	276.10'
W2-2139	N63°09'43"W	277.10'
W2-2140	N83°19'32"W	365.53'
W2-2141	S76°58'51"W	221.12'
W2-2142	S57°17'15"W	288.08'
W2-2143	N69°11'50"W	199.84'
W2-2144	N76°07'54"W	626.45'
W2-2145	S87°07'46"W	230.36'
W2-2146	N36°18'20"W	264.91'
W2-2147	N54°25'40"W	262.97'
W2-2148	N64°34'50"W	595.77'
W2-2149	S71°27'40"W	222.91'
W2-2150	S55°39'01"W	431.85'
W2-2151	N77°52'49"W	1766.13'
W2-2152	S76°34'37"W	282.93'
W2-2153	S25°44'47"W	447.92'
W2-2154	S12°43'22"E	219.98'
W2-2155	S46°29'27"E	365.86'
W2-2156	S26°13'22"E	66.91'
W2-2157	S13°15'35"W	422.71'
W2-2158	S02°58'58"E	183.53'
W2-2159	S25°33'03"E	322.39'
W2-2160	[illegible]	[illegible]
W2-2161	N76°44'44"E	378.67'
W2-2162	N47°30'05"E	286.74'
W2-2163	S50°22'24"E	316.62'
W2-2164	S86°01'55"E	425.63'
W2-2165	S54°42'27"E	211.13'
W2-2166	S22°20'45"W	144.31'
W2-2167	S07°51'21"E	197.28'
W2-2168	S42°17'38"E	527.08'
W2-2169	S71°23'07"E	299.70'
W2-2170	N77°57'19"E	277.69'
W2-2171	N47°20'51"E	176.59'
W2-2172	S73°23'31"E	420.81'
W2-2173	S67°48'23"E	419.65'
W2-2174	S80°15'37"E	779.03'
W2-2175	S00°03'07"E	206.05'
W2-2176	S33°25'21"E	203.28'
W2-2177	S70°13'28"E	841.36'
W2-2178	S81°50'59"E	1075.97'
W2-2179	N65°17'09"E	308.06'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-2180	N88°18'53"E	492.75'
W2-2181	N51°01'42"E	370.15'
W2-2182	N77°22'40"E	347.12'
W2-2183	N38°32'38"E	245.54'
W2-2184	N09°47'42"E	250.69'
W2-2185	N89°30'17"E	215.31'
W2-2186	S62°33'46"E	451.54'
W2-2187	S77°54'35"E	173.66'
W2-2188	N72°29'53"E	273.58'
W2-2189	S72°58'51"E	510.68'
W2-2190	S59°25'57"E	405.18'
W2-2191	N70°56'14"E	425.81'
W2-2192	N26°02'25"E	269.26
W2-2193	N24°06'30"W	560.34'
W2-2194	N08°15'41"E	461.86'
W2-2195	N19°49'17"W	492.09'
W2-2196	S71°20'25"E	1165.11'
W2-2197	S44°08'04"E	1565.04'
W2-2198	S56°54'12"E	145.03'
W2-2199	S82°59'46"E	151.22'
W2-2200	S32°55'32"E	220.84'
W2-2201	N62°26'55"W	512.97'
W2-2202	N83°47'15"W	1203.22'
W2-2203	S66°56'23"W	475.12'
W2-2204	S35°54'57"W	262.86'
W2-2205	S09°13'41"E	455.07'
W2-2206	S40°31'15"E	300.34'
W2-2207	S87°29'59"E	403.74'
W2-2208	S68°59'43"E	211.04'
W2-2209	S47°17'14"E	898.25'
W2-2210	N87°15'33"E	340.37'
W2-2211	S16°57'59"E	592.56'
W2-2212	S49°33'23"E	573.01'
W2-2213	S63°04'39"E	2405.15'
W2-2214	S41°36'51"E	1268.87'
W2-2215	S42°50'03"E	611.07'
W2-2216	S72°50'39"E	648.88'
W2-2217	S51°16'00"E	1076.53'
W2-2218	S28°59'05"W	161.00'
W2-2219	S69°31'25"W	310.30'
W2-2220	N47°08'29"W	682.26'
W2-2221	[illegible]	[illegible]
W2-2222	S57°57'36"W	525.84'
W2-2223	S11°58'17"W	283.58'
W2-2224	S33°02'57"E	392.96'
W2-2225	S00°18'34"W	285.17'
W2-2226	S39°52'06"E	785.03'
W2-2227	S55°39'55"E	921.51'
W2-2228	S72°39'36"E	185.98'
W2-2229	S24°04'42"E	184.01'
W2-2230	S40°23'21"E	1069.62'
W2-2231	S26°41'33"E	398.71'
W2-2232	S12°46'40"E	902.07'
W2-2233	S34°13'09"E	1393.26'
W2-2234	S63°10'49"E	542.72'
W2-2235	S47°43'15"E	614.40'
W2-2236	S79°45'33"E	261.04'
W2-2237	S09°25'48"E	101.34'
W2-2238	S35°36'54"E	195.13'
W2-2239	S52°54'56"E	804.41'
W2-2240	S43°12'45"E	258.48'

W2 LINE TABLE

LINE	BEARING	DISTANCE
W2-2241	S24°36'06"E	522.87'
W2-2242	S54°36'48"E	600.23'
W2-2243	S45°44'01"E	546.84'
W2-2244	S70°57'32"E	515.56'
W2-2245	S60°37'18"E	723.14'
W2-2246	N83°06'12"E	453.94'
W2-2247	S05°19'40"E	149.33'
W2-2248	S27°38'02"E	418.98'
W2-2249	N47°45'51"E	0.92'
W2-2250	S44°19'07"E	77.07'
W2-2251	S54°53'58"W	1256.28'

Book
938

Pgs:
14-23.

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

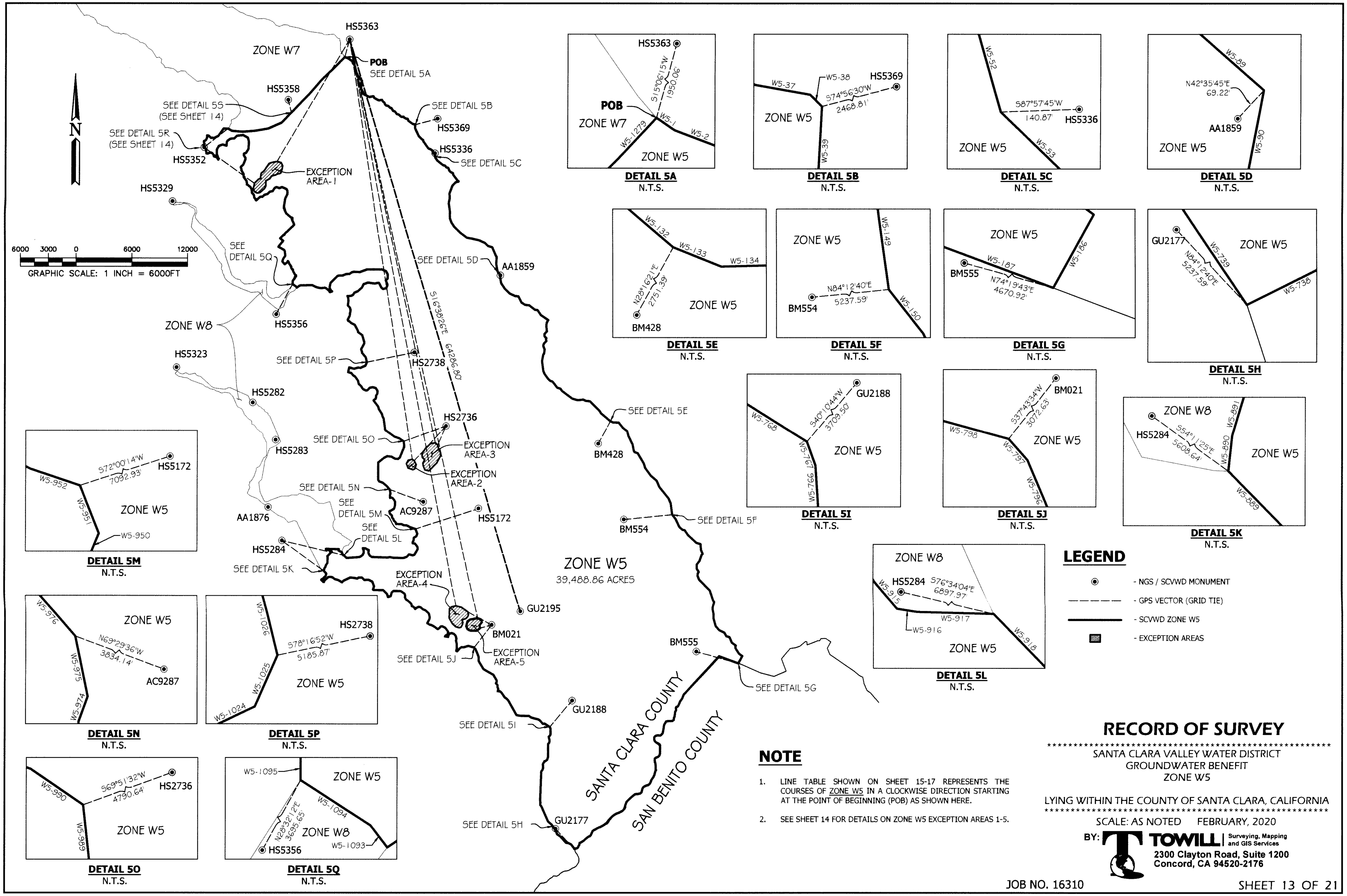
SCALE: NO SCALE   FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 12 OF 21

14


ZONE W7
HS5363
POB
SEE DETAIL 5A
HS5358
SEE DETAIL 5S (SEE SHEET 14)
SEE DETAIL 5R (SEE SHEET 14)
HS5352
EXCEPTION AREA-1
HS5329
SEE DETAIL 5B
HS5369
HS5336
SEE DETAIL 5C
N
6000 3000 0 6000 12000
GRAPHIC SCALE: 1 INCH = 6000FT
SEE DETAIL 5Q
SEE DETAIL 5D
AA1859
S16°38'26"E 64286.80'
HS5356
ZONE W8
HS5323
SEE DETAIL 5P
HS2738
HS5282
HS2736
SEE DETAIL 5O
EXCEPTION AREA-3
EXCEPTION AREA-2
HS5283
SEE DETAIL 5N
AC9287
AA1876
SEE DETAIL 5M
SEE DETAIL 5L
HS5172
HS5284
SEE DETAIL 5K
EXCEPTION AREA-4
BM021
EXCEPTION AREA-5
GU2195
SEE DETAIL 5J
SEE DETAIL 5E
BM428
BM554
SEE DETAIL 5F
ZONE W5
39,488.86 ACRES
BM555
SEE DETAIL 5G
GU2188
SEE DETAIL 5I
SANTA CLARA COUNTY
SAN BENITO COUNTY
SEE DETAIL 5H
GU2177
HS5363 S15°06'15"W 1950.06' POB ZONE W7 W5-1279 W5-1 W5-2 ZONE W5
DETAIL 5A
N.T.S.
W5-37 W5-38 HS5369 S74°56'30"W 2468.81' ZONE W5 W5-39
DETAIL 5B
N.T.S.
W5-52 S87°57'45"W 140.87' HS5336 ZONE W5 W5-53
DETAIL 5C
N.T.S.
W5-89 N42°35'45"E 69.22' AA1859 ZONE W5 W5-90
DETAIL 5D
N.T.S.
W5-132 W5-133 W5-134 N28°16'21"E 2751.39' BM428 ZONE W5
DETAIL 5E
N.T.S.
ZONE W5 W5-149 N84°12'40"E 5237.59' BM554 W5-150
DETAIL 5F
N.T.S.
ZONE W5 W5-187 BM555 N74°19'43"E 4670.92' W5-186
DETAIL 5G
N.T.S.
GU2177 W5-739 N84°12'40"E 5237.59' ZONE W5 W5-738
DETAIL 5H
N.T.S.
W5-768 S40°10'44"W 3709.50' GU2188 ZONE W5 W5-767 W5-766
DETAIL 5I
N.T.S.
W5-798 S37°43'34"W 3072.63' BM021 ZONE W5 W5-797 W5-796
DETAIL 5J
N.T.S.
ZONE W8 HS5284 S54°11'25"E 5608.64' W5-891 W5-890 ZONE W5 W5-889
DETAIL 5K
N.T.S.
ZONE W8 W5-915 HS5284 S76°34'04"E 6897.97 W5-917 W5-916 ZONE W5 W5-918
DETAIL 5L
N.T.S.
W5-952 S72°00'14"W 7092.93' HS5172 ZONE W5 W5-951 W5-950
DETAIL 5M
N.T.S.
W5-976 ZONE W5 N69°29'36"W 3834.14' W5-975 AC9287 W5-974
DETAIL 5N
N.T.S.
W5-1026 HS2738 S78°16'52"W 5185.87' ZONE W5 W5-1025 W5-1024
DETAIL 5P
N.T.S.
W5-990 S69°51'32"W 4790.64' HS2736 ZONE W5 W5-989
DETAIL 5O
N.T.S.
W5-1095 ZONE W5 N28°32'12"E 3695.65' W5-1094 ZONE W8 W5-1093 HS5356
DETAIL 5Q
N.T.S.

LEGEND

◉ - NGS / SCVWD MONUMENT
– – – – - GPS VECTOR (GRID TIE)
━━━ - SCVWD ZONE W5
▨ - EXCEPTION AREAS

NOTE

1. LINE TABLE SHOWN ON SHEET 15-17 REPRESENTS THE COURSES OF ZONE W5 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN HERE.
2. SEE SHEET 14 FOR DETAILS ON ZONE W5 EXCEPTION AREAS 1-5.

RECORD OF SURVEY

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

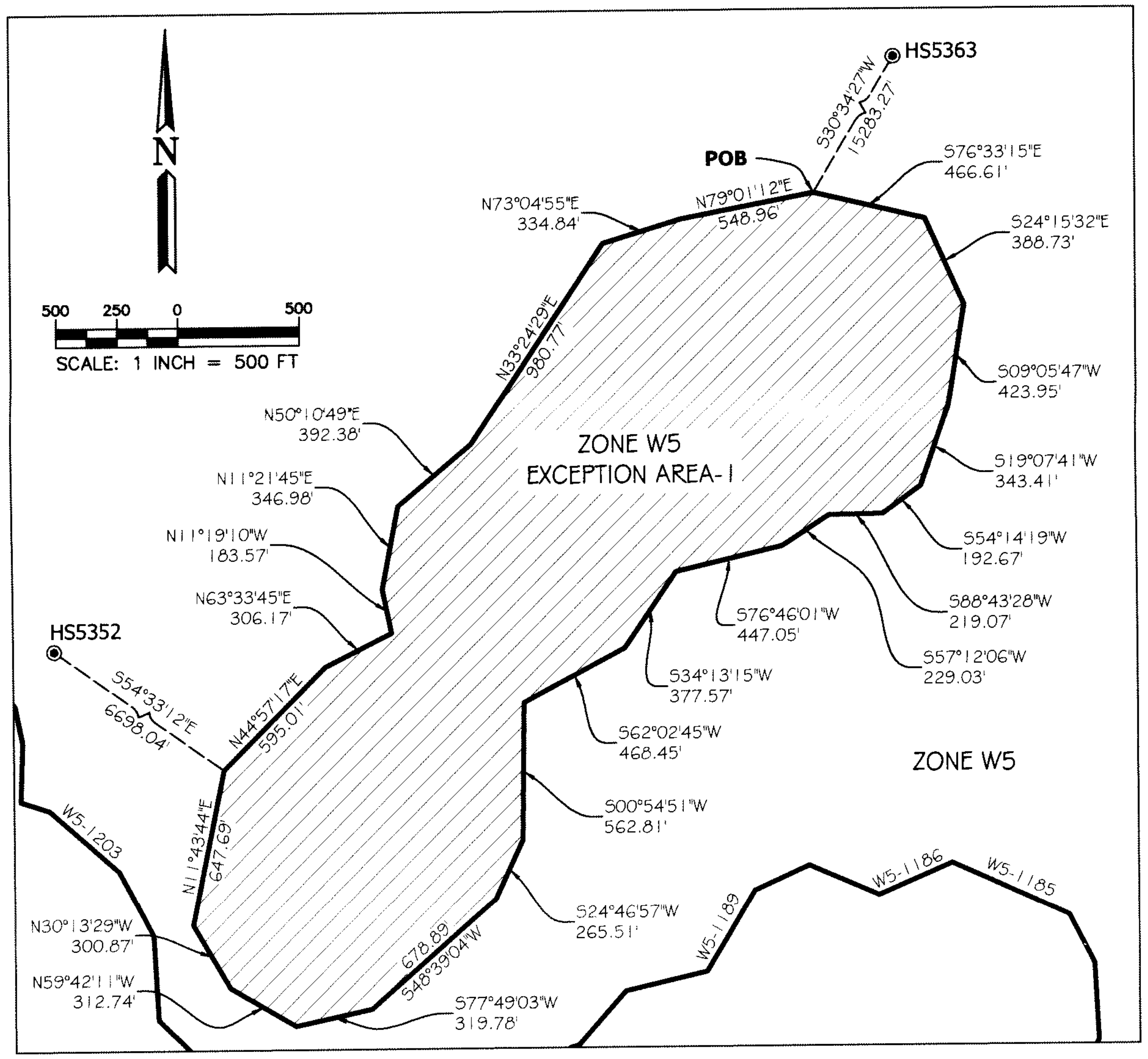
SCALE: AS NOTED FEBRUARY, 2020

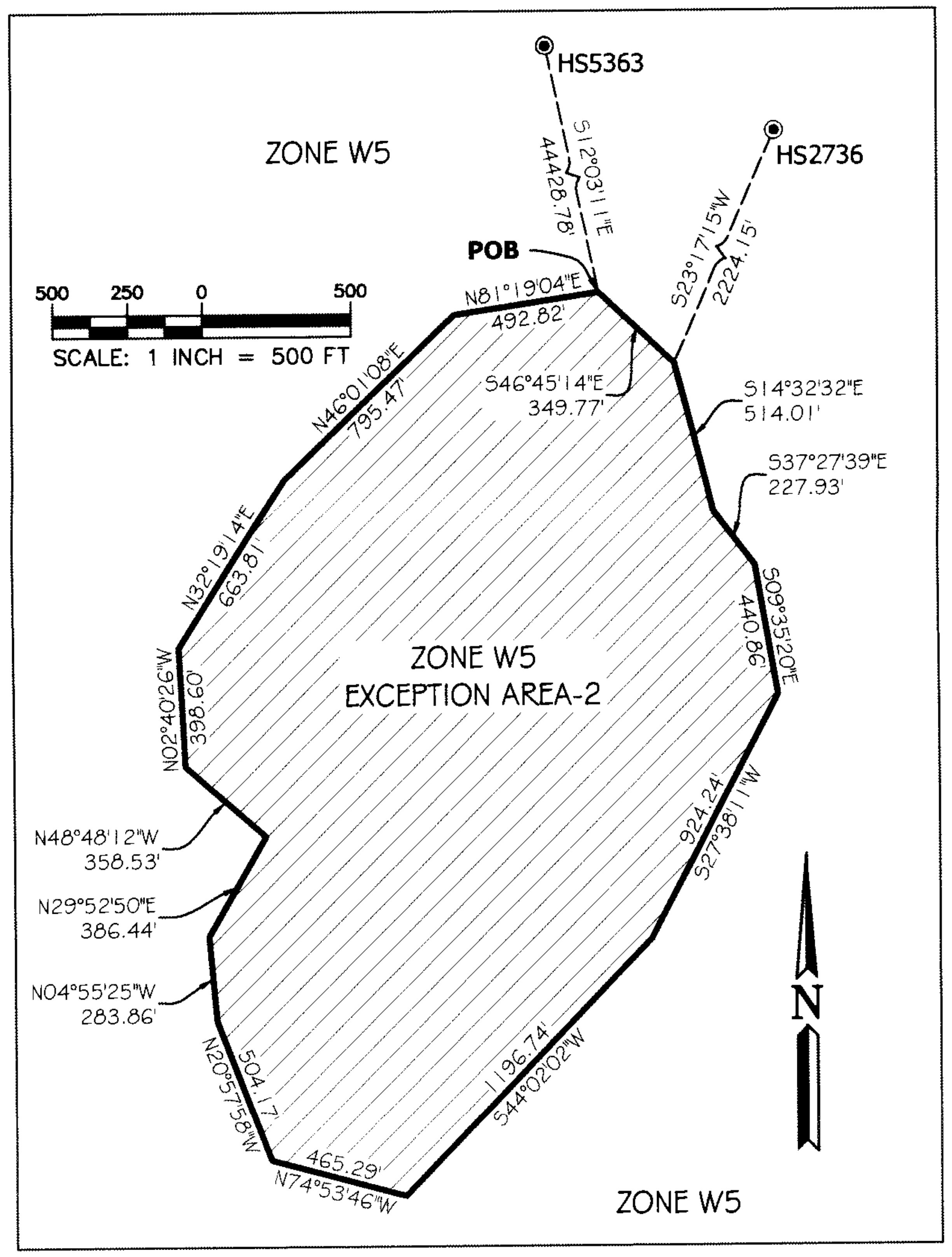
BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

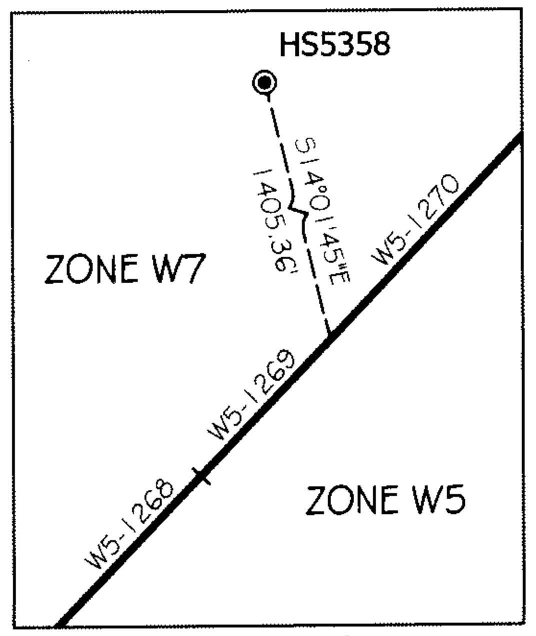
JOB NO. 16310

SHEET 13 OF 21

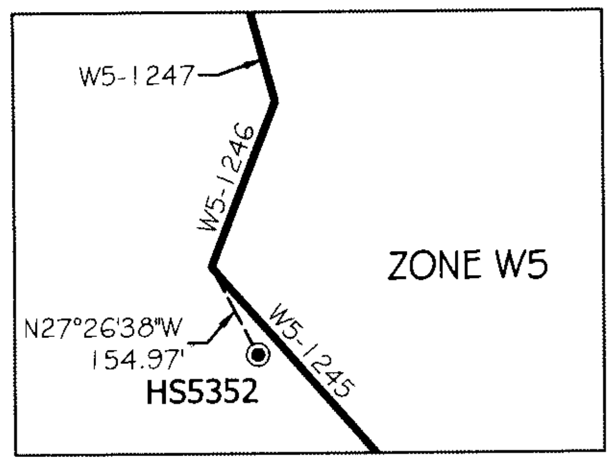
Book 938
Pgs: 15-23.



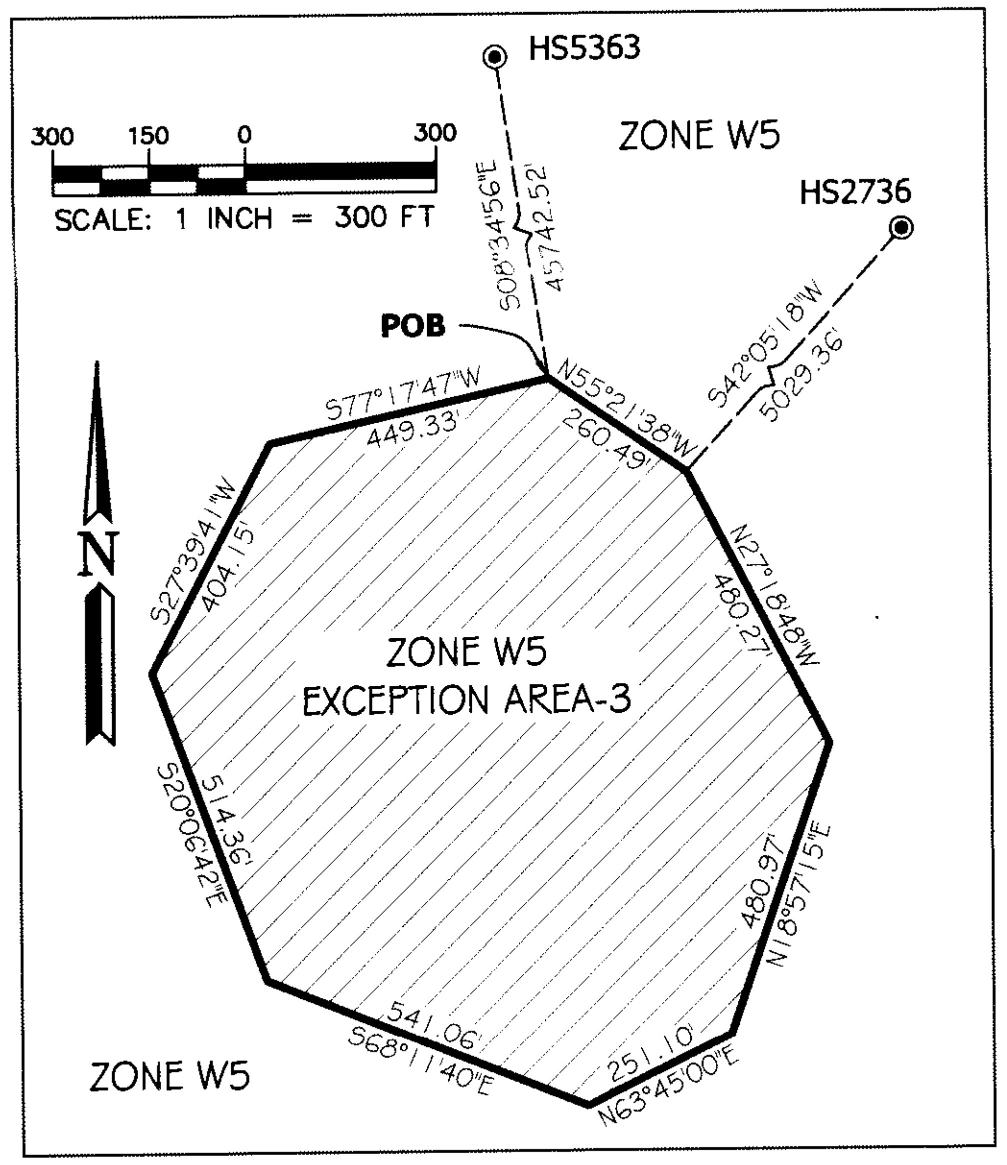


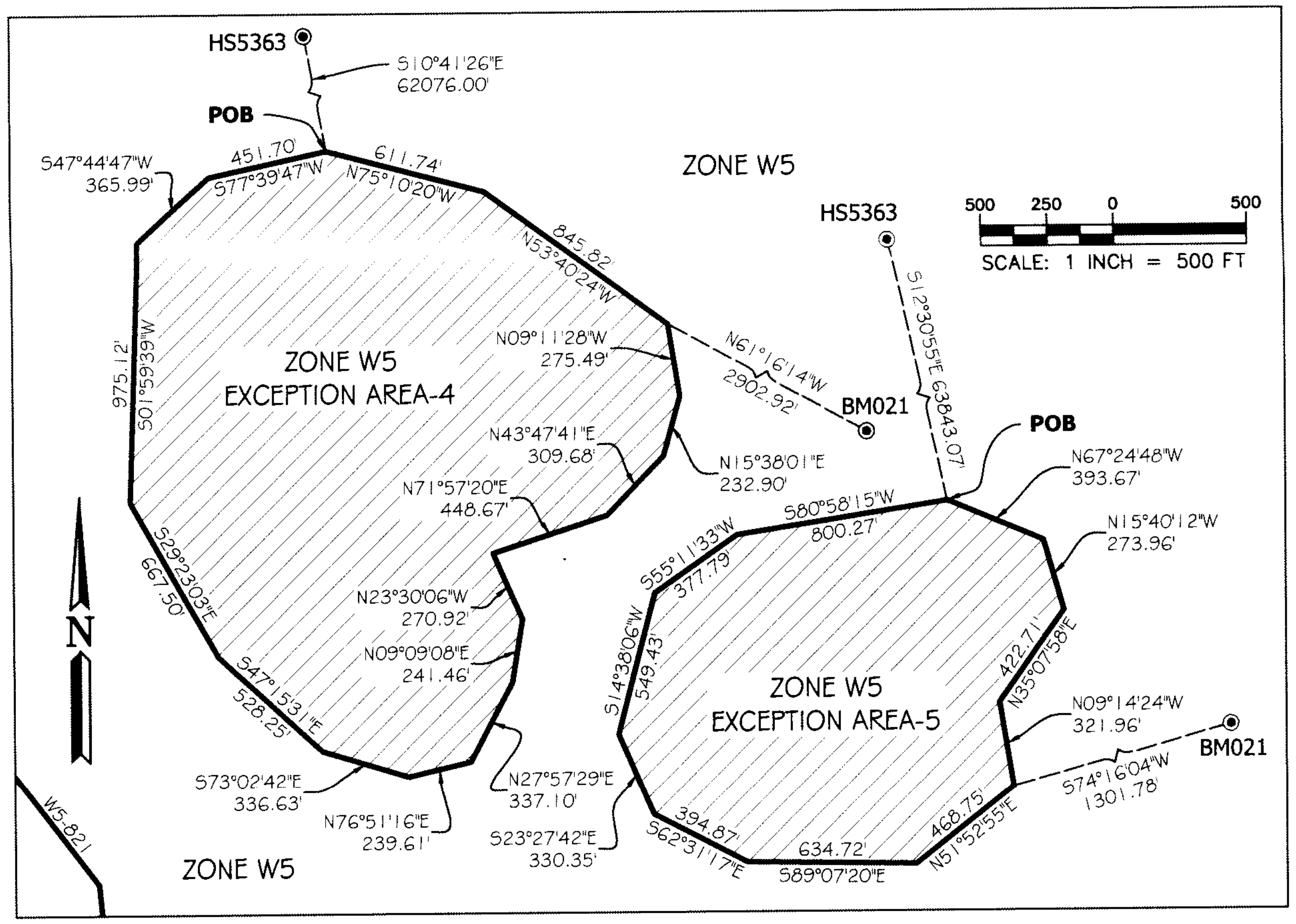


DETAIL 5S
N.T.S.
(SEE SHEET 13 FOR LOCATION)



DETAIL 5R
N.T.S.
(SEE SHEET 13 FOR LOCATION)





Book 938 / Pgs: 16-23.

LEGEND

◉	- NGS / SCVWD MONUMENT
– – – – – –	- GPS VECTOR (GRID TIE)
▬▬▬▬	- SCVWD ZONE W5

NOTE

1. LINE TABLE SHOWN ON SHEET 15-17 REPRESENTS THE COURSES OF ZONE W5 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN HERE.
2. SEE SHEET 13 FOR GENERAL LOCATION OF EXCEPTION AREAS.

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: AS NOTED FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 14 OF 21

#16.

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1	S55°41'00"E	117.74'
W5-2	S69°07'16"E	269.96'
W5-3	S54°34'53"E	534.66'
W5-4	S19°39'30"E	213.43'
W5-5	S40°32'47"E	261.62'
W5-6	S11°00'22"E	637.40'
W5-7	S24°41'52"E	596.78'
W5-8	S39°44'28"E	712.73'
W5-9	S22°48'04"W	270.47'
W5-10	S00°05'09"E	583.31'
W5-11	S26°13'57"E	672.47'
W5-12	S63°44'01"E	678.75'
W5-13	[illegible]	425.62'
W5-14	S26°38'39"E	196.44'
W5-15	S61°18'41"E	557.31'
W5-16	N81°53'24"E	340.24'
W5-17	S34°50'06"E	225.78'
W5-18	S50°04'25"E	194.27'
W5-19	S10°57'44"E	141.82'
W5-20	S40°03'06"E	187.54'
W5-21	S75°18'40"E	297.77'
W5-22	S40°01'25"E	211.26'
W5-23	S70°16'53"E	190.39'
W5-24	S31°34'45"E	335.32'
W5-25	S70°39'57"E	208.04'
W5-26	S37°30'52"E	340.90'
W5-27	S73°57'51"E	222.13'
W5-28	S44°00'13"E	279.62'
W5-29	S69°55'58"E	149.59'
W5-30	N83°50'04"E	175.55'
W5-31	S36°44'40"E	93.79'
W5-32	S56°50'36"E	246.43'
W5-33	S82°03'21"E	200.34'
W5-34	S08°54'25"E	86.03'
W5-35	S29°48'32"E	151.71'
W5-36	S54°22'03"E	564.82'
W5-37	S79°51'38"E	201.10'
W5-38	S44°35'18"E	59.92'
W5-39	S02°57'43"W	316.92'
W5-40	S08°07'03"E	90.42'
W5-41	S24°46'18"E	899.71'
W5-42	[illegible]	459.27'
W5-43	S60°03'28"E	172.59'
W5-44	S11°33'57"E	151.15'
W5-45	S35°39'43"E	885.43'
W5-46	S49°21'36"E	145.80'
W5-47	S77°53'43"E	177.10'
W5-48	S41°02'12"E	100.72'
W5-49	S58°31'45"E	100.40'
W5-50	S28°41'02"E	83.30'
W5-51	S43°49'05"E	88.62'
W5-52	S15°55'16"E	197.56'
W5-53	S46°03'15"E	206.81'
W5-54	S06°28'16"E	302.05'
W5-55	S33°42'58"E	404.15'
W5-56	S51°20'26"E	760.48'
W5-57	S73°54'01"E	241.85'
W5-58	S36°46'47"E	212.96'
W5-59	S74°26'17"E	227.94'
W5-60	S22°20'35"E	325.15'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-61	S36°56'39"E	165.41'
W5-62	S64°18'17"E	313.84'
W5-63	S10°57'14"E	193.78'
W5-64	S37°27'42"E	781.57'
W5-65	S53°02'12"E	113.50'
W5-66	S17°04'08"W	42.95'
W5-67	S82°56'04"W	177.64'
W5-68	S63°36'58"W	217.07'
W5-69	S40°39'37"W	422.44'
W5-70	S20°20'03"W	913.22'
W5-71	S05°49'05"E	485.13'
W5-72	S12°14'46"W	554.19'
W5-73	S09°06'24"E	975.02'
W5-74	S01°36'18"W	635.55'
W5-75	S20°55'36"E	514.94'
W5-76	S33°01'11"E	491.98'
W5-77	S44°14'57"E	951.17'
W5-78	S53°17'32"E	905.85'
W5-79	S80°13'19"E	581.98'
W5-80	S76°24'27"E	778.93'
W5-81	S65°24'12"E	643.79'
W5-82	S45°51'59"E	480.28'
W5-83	S73°35'54"E	461.59'
W5-84	S22°27'04"E	1014.26'
W5-85	S42°49'43"E	143.69'
W5-86	S05°04'29"W	717.50'
W5-87	S09°06'18"E	832.17'
W5-88	S27°26'20"E	206.40'
W5-89	S48°41'53"E	345.84'
W5-90	S10°42'33"W	317.04'
W5-91	S10°34'41"E	584.53'
W5-92	S32°33'30"E	659.79'
W5-93	S44°58'16"E	749.79'
W5-94	S63°41'29"E	699.23'
W5-95	S86°49'32"E	323.68'
W5-96	S26°28'43"E	732.95'
W5-97	S58°06'02"E	500.28'
W5-98	S83°19'55"E	441.72'
W5-99	S51°40'40"E	798.37'
W5-100	S86°10'02"E	260.67'
W5-101	S33°58'06"E	635.52'
W5-102	[illegible]	875.67'
W5-103	S30°52'01"W	301.18'
W5-104	S11°07'37"W	342.80'
W5-105	S07°19'33"E	643.49'
W5-106	S46°02'40"W	398.68'
W5-107	S04°27'25"E	242.33'
W5-108	S48°38'14"E	264.78'
W5-109	S15°04'06"W	138.68'
W5-110	S09°29'55"E	193.97'
W5-111	S42°28'55"W	361.77'
W5-112	S21°28'34"W	235.21'
W5-113	S20°42'32"E	467.19'
W5-114	S09°36'09"W	427.52'
W5-115	S40°37'36"W	134.59'
W5-116	S10°49'59"W	729.60'
W5-117	S08°23'56"E	1078.27'
W5-118	S23°11'03"E	344.04'
W5-119	S35°50'36"E	662.47'
W5-120	S47°47'36"E	316.70'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-121	S70°35'02"E	280.08'
W5-122	S36°36'10"E	783.70'
W5-123	S72°01'06"E	393.26'
W5-124	S31°35'00"E	259.93'
W5-125	S53°11'28"E	1421.52'
W5-126	S72°44'42"E	554.50'
W5-127	N83°39'49"E	640.73'
W5-128	S63°18'40"E	317.43'
W5-129	S83°53'20"E	429.14'
W5-130	S45°36'47"E	1405.56'
W5-131	S31°57'16"E	358.31'
W5-132	S49°24'44"E	1321.13'
W5-133	S68°01'54"E	370.45'
W5-134	N88°40'12"E	542.14'
W5-135	S38°49'26"E	770.45'
W5-136	S52°15'51"E	544.14'
W5-137	S15°12'40"E	532.04'
W5-138	S25°16'28"E	1030.05'
W5-139	S10°50'59"E	648.00'
W5-140	S28°45'10"E	201.71'
W5-141	S69°38'46"E	362.84'
W5-142	S30°28'15"E	1291.82'
W5-143	S17°34'44"E	489.13'
W5-144	S35°40'38"E	1017.41'
W5-145	S49°28'33"E	849.54'
W5-146	S23°34'05"E	748.05'
W5-147	S38°44'09"E	1577.40'
W5-148	S24°21'08"E	557.45'
W5-149	S07°40'50"E	1247.69'
W5-150	S37°53'47"E	601.39'
W5-151	S25°47'02"E	948.46'
W5-152	S48°15'12"E	461.90'
W5-153	S79°55'58"E	237.36'
W5-154	S33°29'57"E	596.39'
W5-155	S47°21'23"E	1262.03'
W5-156	S71°55'11"E	483.65'
W5-157	S03°48'43"E	591.63'
W5-158	S22°06'48"E	482.18'
W5-159	S41°03'47"W	178.07'
W5-160	S18°48'32"W	658.48'
W5-161	S37°39'31"W	499.30'
W5-162	[illegible]	463.95'
W5-163	S32°06'54"E	390.24
W5-164	S30°40'18"W	185.03'
W5-165	S06°09'06"W	245.85'
W5-166	S22°39'50"E	464.98'
W5-167	S44°06'50"E	1631.18'
W5-168	S17°04'11"E	1149.72'
W5-169	S42°36'25"E	153.01'
W5-170	S16°56'07"W	644.46'
W5-171	S02°16'58"W	165.98'
W5-172	S11°04'49"E	484.19'
W5-173	S02°38'27"E	546.74'
W5-174	S15°16'36"E	827.10'
W5-175	S40°28'43"E	573.06'
W5-176	S64°01'48"E	627.92'
W5-177	S29°02'42"E	432.71'
W5-178	S73°07'37"E	343.28'
W5-179	S22°55'01"E	135.24'
W5-180	S22°55'01"E	512.71'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-181	S54°20'18"E	530.62'
W5-182	S25°50'57"W	119.52'
W5-183	S00°48'57"E	182.51'
W5-184	S33°39'29"E	716.08'
W5-185	S54°23'11"E	425.77'
W5-186	S29°04'33"W	903.84'
W5-187	N69°26'05"W	1241.26'
W5-188	N69°25'10"W	563.80'
W5-189	N69°25'11"W	358.69'
W5-190	N69°25'11"W	33.54'
W5-191	S39°20'38"W	119.97'
W5-192	S39°08'38"W	65.17'
W5-193	S39°36'52"W	48.26
W5-194	S42°28'17"W	146.19'
W5-195	S42°47'39"W	64.37'
W5-196	S42°32'18"W	855.03'
W5-197	S42°33'10"W	1531.84'
W5-198	S42°33'10"W	1032.75'
W5-199	S42°34'31"W	628.25'
W5-200	S42°34'48"W	226.73'
W5-201	S42°27'43"W	777.68'
W5-202	S41°14'39"W	117.54'
W5-203	S21°36'54"W	180.97'
W5-204	S30°49'30"E	8.96'
W5-205	S35°25'39"W	13.30'
W5-206	S17°21'34"W	9.13'
W5-207	S46°02'00"W	17.64'
W5-208	S15°04'27"W	10.53'
W5-209	S37°31'37"W	21.40'
W5-210	S19°47'09"W	127.21'
W5-211	S17°21'36"W	54.75'
W5-212	S13°14'59"W	25.37'
W5-213	S35°01'25"W	36.19'
W5-214	S37°57'58"W	37.56'
W5-215	S44°16'16"W	18.62'
W5-216	S33°18'37"W	28.12'
W5-217	S40°26'59"W	59.75'
W5-218	S34°42'43"W	42.21'
W5-219	S35°54'47"W	7.58'
W5-220	S39°10'13"W	69.84'
W5-221	S17°21'35"W	18.25'
W5-222	S41°23'40"W	9.23'
W5-223	S19°35'27"W	16.17'
W5-224	S46°49'28"W	10.52'
W5-225	S20°01'11"W	31.66'
W5-226	S36°56'58"W	21.70'
W5-227	S22°28'29"W	94.16'
W5-228	S17°40'11"W	12.95'
W5-229	S33°07'12"W	14.68'
W5-230	S15°04'35"W	10.53'
W5-231	S32°08'50"W	14.52'
W5-232	S18°47'13"W	42.15'
W5-233	S35°01'28"W	18.09'
W5-234	S21°40'43"W	29.26'
W5-235	S14°31'05"W	35.26'
W5-236	S21°58'42"W	62.56'
W5-237	S35°01'29"W	18.09'
W5-238	S12°47'42"W	63.70'
W5-239	S33°28'13"W	71.08'
W5-240	S43°33'42"W	74.61'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-241	S46°46'40"W	24.71'
W5-242	S54°05'36"W	25.08'
W5-243	S74°12'05"W	83.76'
W5-244	S53°01'43"W	12.54'
W5-245	N86°38'29"W	7.60'
W5-246	S56°45'00"W	9.15'
W5-247	S46°32'09"W	60.19'
W5-248	S18°02'49"W	26.33'
W5-249	S01°18'00"E	52.46'
W5-250	S10°54'13"E	23.41'
W5-251	S35°00'14"E	12.54'
W5-252	S13°36'57"E	72.50'
W5-253	S04°24'48"E	83.34'
W5-254	S19°52'34"W	23.91'
W5-255	S12°29'38"W	38.32'
W5-256	S32°12'52"W	64.12'
W5-257	S34°06'49"W	59.82'
W5-258	S41°20'56"W	19.70'
W5-259	S19°17'00"W	65.72'
W5-260	S06°45'48"W	133.67'
W5-261	S01°41'04"W	62.64'
W5-262	S09°10'18"W	47.13'
W5-263	S25°00'42"W	9.20'
W5-264	S05°07'04"W	57.49'
W5-265	S05°07'04"W	20.67'
W5-266	S22°06'55"W	21.52'
W5-267	S01°44'11"W	14.93'
W5-268	S07°29'26"W	49.31'
W5-269	S07°29'26"W	92.25'
W5-270	S33°07'22"W	14.68'
W5-271	S20°34'25"W	53.07'
W5-272	S41°20'56"W	19.70'
W5-273	S12°36'24"W	12.66'
W5-274	S35°01'36"W	36.19'
W5-275	S17°21'48"W	20.76'
W5-276	S17°21'48"W	15.75'
W5-277	S01°34'23"W	20.70'
W5-278	S01°34'23"W	14.26'
W5-279	S08°16'27"E	43.49'
W5-280	S36°04'31"E	12.71'
W5-281	S09°38'23"W	70.78'
W5-282	[illegible]	31.28'
W5-283	S30°18'23"W	15.93'
W5-284	S43°14'38"W	67.30'
W5-285	S48°07'48"W	32.88'
W5-286	S60°00'23"W	33.61'
W5-287	S56°11'20"W	21.25'
W5-288	S74°01'19"W	42.07'
W5-289	S88°29'08"W	235.07'
W5-290	N88°20'55"W	20.16'
W5-291	N51°47'55"W	12.54'
W5-292	S75°30'24"W	36.32'
W5-293	S88°13'48"W	87.44'
W5-294	S83°33'36"W	133.37'
W5-295	S75°59'15"W	44.69'
W5-296	S54°22'28"W	12.32'
W5-297	S80°45'10"W	12.75'
W5-298	S79°38'44"W	13.39'
W5-299	N87°47'45"W	13.15'
W5-300	S86°29'07"W	40.43'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-301	S13°53'46"W	12.72'
W5-302	S00°37'02"W	25.85'
W5-303	S09°44'06"W	12.91'
W5-304	S21°18'19"W	13.23'
W5-305	S41°04'07"W	30.62'
W5-306	S42°00'57"W	34.46'
W5-307	S34°16'06"W	38.49'
W5-308	S27°52'39"W	38.91'
W5-309	S36°35'10"W	51.74'
W5-310	S27°55'18"W	64.33'
W5-311	S18°47'28"W	25.29'
W5-312	S21°52'38"W	25.79'
W5-313	S22°50'53"W	63.33'
W5-314	S14°56'26"W	33.07'
W5-315	S14°09'13"W	18.73'
W5-316	S21°52'42"W	12.89'
W5-317	S14°04'11"W	38.94'
W5-318	S07°28'53"W	124.69'
W5-319	S07°37'35"W	131.70'
W5-320	S03°53'56"W	25.53'
W5-321	S08°50'03"W	50.62'
W5-322	S08°50'03"W	158.87'
W5-323	S08°50'03"W	21.54'
W5-324	S06°35'34"W	25.26'
W5-325	S12°46'06"W	167.97'
W5-326	S07°39'13"W	4.77'
W5-327	S11°06'35"W	33.70'
W5-328	S24°38'47"W	25.12'
W5-329	S20°19'02"W	25.14'
W5-330	S16°25'54"W	25.73'
W5-331	S24°54'46"W	12.78'
W5-332	S34°12'28"W	12.68'
W5-333	S42°41'38"W	51.02'
W5-334	S41°49'08"W	15.97'
W5-335	S42°35'53"W	48.49'
W5-336	S43°28'34"W	15.89'
W5-337	S42°39'50"W	51.48'
W5-338	S52°47'14"W	25.53'
W5-339	S43°24'59"W	12.90'
W5-340	S52°56'29"W	26.21'
W5-341	S65°16'14"W	39.12'
W5-342	S82°33'30"W	12.98'
W5-343	S69°22'23"W	[illegible]
W5-344	S77°51'12"W	26.36'
W5-345	N89°22'51"W	13.15'
W5-346	S85°47'22"W	51.90'
W5-347	N87°01'45"W	26.61'
W5-348	N80°51'20"W	39.30'
W5-349	N78°20'48"W	78.00'
W5-350	N86°12'39"W	26.34'
W5-351	S76°46'52"W	25.88'
W5-352	S80°04'36"W	91.54'
W5-353	S75°23'42"W	26.35'
W5-354	S65°50'42"W	26.07'
W5-355	S69°25'47"W	14.10'
W5-356	S71°42'13"W	12.35'
W5-357	S58°41'41"W	26.16'
W5-358	S54°16'59"W	52.23'
W5-359	S41°54'35"W	25.68'
W5-360	S46°44'32"W	51.48'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-361	S42°20'38"W	4.39'
W5-362	S41°52'32"W	20.83'
W5-363	S31°23'22"W	26.27'
W5-364	S33°54'30"W	36.69'
W5-365	S33°54'30"W	1.64'
W5-366	S30°49'41"W	21.49'
W5-367	S11°02'25"E	13.01'
W5-368	S00°41'38"E	16.08'
W5-369	S00°41'38"E	9.42'
W5-370	S05°27'31"E	77.26'
W5-371	S09°15'55"E	64.68'
W5-372	S07°59'08"E	53.77'
W5-373	S07°59'08"E	10.68'
W5-374	S14°16'24"E	64.80'
W5-375	S26°38'55"E	50.38'
W5-376	S30°25'26"E	25.50'
W5-377	S34°03'24"E	38.52'
W5-378	S43°08'23"E	104.35'
W5-379	S51°28'08"E	38.52'
W5-380	S56°18'45"E	38.70'
W5-381	S59°10'46"E	51.39'
W5-382	S48°24'27"E	12.77'
W5-383	S60°33'39"E	25.68'
W5-384	S54°41'15"E	25.59'
W5-385	S57°04'48"E	47.01'
W5-386	S57°27'24"E	29.61'
W5-387	S54°07'09"E	63.70'
W5-388	S57°37'47"E	51.20'
W5-389	S51°28'12"E	38.52'
W5-390	S45°55'29"E	38.64'
W5-391	S42°10'50"E	25.80'
W5-392	S29°18'07"E	63.85'
W5-393	S23°02'58"E	51.68'
W5-394	S17°33'26"E	25.29'
W5-395	S07°19'55"E	141.54'
W5-396	S00°52'41"W	64.45'
W5-397	S06°00'46"W	12.43'
W5-398	S00°40'37"E	25.86'
W5-399	S05°56'05"W	25.23'
W5-400	S00°17'23"W	50.98'
W5-401	S05°12'25"W	25.57'
W5-402	[illegible]	38.61'
W5-403	[illegible]	[illegible]
W5-404	S07°48'22"W	25.69'
W5-405	S00°21'34"E	51.35'
W5-406	S04°33'13"W	25.55'
W5-407	S00°18'27"W	269.08'
W5-408	S02°35'17"W	14.59'
W5-409	S02°35'17"W	10.91'
W5-410	S10°46'18"W	89.52'
W5-411	S17°40'41"W	38.85'
W5-412	S23°59'23"W	25.78'
W5-413	S19°04'29"W	38.77'
W5-414	S32°18'28"W	38.94'
W5-415	S46°03'33"W	25.43'
W5-416	S42°54'27"W	51.68'
W5-417	S54°21'14"W	38.78'
W5-418	S69°17'52"W	26.04'
W5-419	S64°41'52"W	183.25'
W5-420	S77°51'18"W	13.18'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-421	S70°16'21"W	26.18'
W5-422	S62°37'07"W	51.96'
W5-423	S55°32'39"W	64.63'
W5-424	S62°06'43"W	12.97'
W5-425	S49°09'48"W	52.25'
W5-426	S36°21'27"W	13.01'
W5-427	S30°17'01"W	25.98'
W5-428	S01°42'53"W	15.30'
W5-429	S15°35'49"W	26.01'
W5-430	S04°31'58"W	64.23'
W5-431	S05°55'15"E	25.65'
W5-432	S09°11'41"E	147.44'
W5-433	S08°30'01"E	5.53'
W5-434	S15°11'46"E	12.87'
W5-435	S04°17'42"E	51.16'
W5-436	S12°17'47"E	13.07'
W5-437	S20°11'45"E	51.81'
W5-438	S38°07'49"E	13.07'
W5-439	S00°41'41"E	12.75'
W5-440	S18°24'43"E	90.51'
W5-441	S08°37'48"E	25.45'
W5-442	S03°47'35"E	37.98'
W5-443	S01°16'33"W	25.49'
W5-444	S02°18'06"E	63.07'
W5-445	S06°00'56"E	25.29'
W5-446	S00°37'10"W	25.12'
W5-447	S02°42'33"E	50.33'
W5-448	S07°09'35"W	12.83'
W5-449	S03°22'41"E	138.33'
W5-450	S18°11'00"E	12.69'
W5-451	S02°05'01"E	24.79'
W5-452	S07°56'19"E	88.37'
W5-453	S01°35'26"E	37.90'
W5-454	S02°55'06"W	7.29'
W5-455	S02°38'51"W	24.77'
W5-456	S04°05'07"W	19.33'
W5-457	S03°25'52"E	12.41'
W5-458	S03°54'01"W	25.53'
W5-459	S04°46'25"E	12.43'
W5-460	S12°57'59"W	4.10'
W5-461	S17°22'12"W	9.13'
W5-462	S00°28'32"E	15.30'
W5-463	S23°42'43"W	[illegible]
W5-464	S12°42'00"W	16.76'
W5-465	S12°09'09"W	21.92'
W5-466	S09°18'42"W	38.68'
W5-467	S23°42'43"W	12.67'
W5-468	S04°09'10"W	18.97'
W5-469	S04°33'18"W	12.77'
W5-470	S18°25'07"W	51.63'
W5-471	S10°43'50"W	3.33'
W5-472	S14°53'51"W	61.62'
W5-473	S17°11'03"W	64.58'
W5-474	S11°48'19"W	25.61'
W5-475	S14°58'26"W	51.87'
W5-476	S12°23'24"W	38.68'
W5-477	S15°47'00"W	29.05'
W5-478	S15°35'56"W	9.05'
W5-479	S24°55'03"W	25.57'
W5-480	S13°42'58"W	51.59'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-481	S20°39'48"W	38.37'
W5-482	S26°27'07"W	25.49'
W5-483	S17°55'12"W	76.65'
W5-484	S16°07'21"W	51.39'
W5-485	S33°36'59"W	38.64'
W5-486	S35°52'48"W	190.85'
W5-487	S36°07'34"W	68.43'
W5-488	S24°55'07"W	25.57'
W5-489	S33°51'52"W	26.12'
W5-490	S29°09'16"W	25.70'
W5-491	S25°01'38"W	140.74'
W5-492	S11°00'57"W	12.96'
W5-493	S27°59'49"W	12.71'
W5-494	S37°23'30"W	13.18'
W5-495	S20°56'51"W	25.24'
W5-496	S16°14'49"W	24.95'
W5-497	S24°09'21"W	51.23'
W5-498	S13°54'12"W	12.72'
W5-499	S23°31'52"W	89.34'
W5-500	S33°37'04"W	38.64'
W5-501	S25°15'33"W	25.24'
W5-502	S33°19'34"W	51.93'
W5-503	S23°23'45"W	25.67'
W5-504	S40°22'31"W	26.05'
W5-505	S44°47'47"W	38.58'
W5-506	S48°50'25"W	38.80'
W5-507	S58°42'02"W	52.34'
W5-508	S61°24'51"W	26.12'
W5-509	S53°20'10"W	13.22'
W5-510	S63°27'47"W	39.09'
W5-511	S69°18'07"W	78.12'
W5-512	S82°44'24"W	13.28'
W5-513	S72°32'56"W	12.91'
W5-514	S65°56'27"W	39.24'
W5-515	S70°16'36"W	26.18'
W5-516	S65°51'06"W	52.14'
W5-517	S68°19'01"W	51.81'
W5-518	S75°40'26"W	12.70'
W5-519	S65°51'05"W	26.07'
W5-520	S70°25'51"W	51.69'
W5-521	S54°05'26"W	13.46'
W5-522	S68°34'47"W	12.61'
W5-523	[illegible]	[illegible]
W5-524	S65°07'48"W	26.23'
W5-525	S53°35'10"W	25.99'
W5-526	S49°39'13"W	38.32'
W5-527	S39°22'28"W	13.07'
W5-528	S49°25'14"W	14.37'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-529	S51°23'56"W	10.94'
W5-530	S43°25'35"W	38.71'
W5-531	S33°19'39"W	12.98'
W5-532	S24°55'17"W	12.78'
W5-533	S39°22'30"W	26.15'
W5-534	S30°49'40"W	38.34'
W5-535	S27°47'05"W	64.66'
W5-536	S20°40'01"W	12.79'
W5-537	S14°57'48"W	50.74'
W5-538	S16°58'36"W	141.16'
W5-539	S14°12'14"W	38.58'
W5-540	S07°57'29"W	38.91'
W5-541	S14°46'50"W	13.14'
W5-542	S03°10'35"W	13.12'
W5-543	S26°06'14"W	12.91'
W5-544	S14°58'39"W	25.93'
W5-545	S19°46'52"W	25.83'
W5-546	S29°50'25"W	64.66'
W5-547	S43°25'39"W	38.71'
W5-548	S46°40'49"W	64.54'
W5-549	S53°16'07"W	52.21'
W5-550	S59°23'08"W	25.98'
W5-551	S66°50'39"W	26.19'
W5-552	S85°52'33"W	13.20'
W5-553	S72°20'56"W	25.55'
W5-554	S78°43'03"W	38.83'
W5-555	S81°01'45"W	117.97'
W5-556	S82°56'44"W	79.03'
W5-557	S80°11'42"W	26.15'
W5-558	S89°39'33"W	64.89'
W5-559	N85°22'21"W	26.08'
W5-560	S87°49'08"W	52.08'
W5-561	S74°06'08"W	12.80'
W5-562	S67°17'46"W	49.65'
W5-563	S62°41'39"W	15.55'
W5-564	S55°01'40"W	65.06'
W5-565	S48°00'38"W	25.81'
W5-566	S55°29'31"W	38.60'
W5-567	S62°43'28"W	13.23'
W5-568	S54°56'35"W	51.81'
W5-569	S51°48'35"W	65.64'
W5-570	S49°50'50"W	20.55'
W5-571	S49°50'50"W	44.63'
W5-572	S46°36'05"W	19.11'
W5-573	S46°36'05"W	71.53'
W5-574	S48°43'08"W	129.20'
W5-575	S45°29'28"W	25.69'
W5-576	S48°50'44"W	38.80'

Book
938
/
Pgs:
17-23

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: **TOWILL** Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 15 OF 21

#17.

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-577	S45°52'33"W	38.27'
W5-578	S47°35'30"W	167.53'
W5-579	S44°10'47"W	51.75'
W5-580	S48°00'42"W	25.81'
W5-581	S45°26'53"W	64.68'
W5-582	S42°55'09"W	51.68'
W5-583	S46°58'48"W	25.85'
W5-584	S41°25'46"W	25.49'
W5-585	S46°58'48"W	25.85'
W5-586	S44°29'25"W	76.76'
W5-587	S47°07'12"W	1.99'
W5-588	S47°07'12"W	23.40'
W5-589	S35°37'10"W	38.22'
W5-590	S20°51'32"W	1.45
W5-591	S20°51'32"W	36.58'
W5-592	S26°06'33"W	12.91'
W5-593	S36°22'07"W	13.01'
W5-594	S09°13'31"W	25.41'
W5-595	S20°32'16"W	309.81'
W5-596	S16°26'39"W	38.60'
W5-597	S08°31'01"W	51.09'
W5-598	S14°12'32"W	38.58'
W5-599	S20°07'36"W	13.13'
W5-600	S10°13'06"W	77.18'
W5-601	S29°09'46"W	12.85'
W5-602	S22°41'41"W	38.90'
W5-603	S20°23'47"W	103.69'
W5-604	S36°18'48"W	25.55'
W5-605	S32°53'53"W	64.59'
W5-606	S31°13'49"W	64.30'
W5-607	S43°26'01"W	38.71'
W5-608	S46°54'51"W	52.16'
W5-609	S43°26'03"W	25.81'
W5-610	S56°51'41"W	91.06'
W5-611	S60°45'24"W	51.91'
W5-612	S50°30'25"W	13.00'
W5-613	S66°18'35"W	65.43'
W5-614	S63°23'13"W	64.43'
W5-615	S64°51'34"W	77.89'
W5-616	S61°39'23"W	39.09'
W5-617	S72°57'03"W	13.19'
W5-618	S55°56'31"W	12.80'
W5-619	[illegible]	[illegible]
W5-620	S73°19'44"W	39.18'
W5-621	S67°30'58"W	34.32'
W5-622	S77°51'58"W	13.19'
W5-623	S59°22'31"W	13.33'
W5-624	S74°56'29"W	52.52'
W5-625	S67°46'19"W	104.99'
W5-626	S61°24'22"W	105.16'
W5-627	S60°10'32"W	145.12'
W5-628	S57°21'29"W	91.59'
W5-629	S49°16'45"W	78.26'
W5-630	S51°29'01"W	104.40'
W5-631	S47°59'31"W	9.14'
W5-632	S48°04'50"W	30.15'
W5-633	S35°18'46"W	12.84'
W5-634	S44°49'21"W	243.03'
W5-635	S44°49'21"W	31.19'
W5-636	S43°06'49"W	17.36'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-637	S43°06'49"W	87.80'
W5-638	S45°33'59"W	91.04'
W5-639	S29°10'03"W	12.85'
W5-640	S39°29'49"W	38.92'
W5-641	S39°29'49"W	78.93'
W5-642	S31°49'10"W	25.96'
W5-643	S35°47'31"W	156.33'
W5-644	S37°32'30"W	19.38'
W5-645	S37°32'30"W	58.49'
W5-646	S40°52'50"W	26.24'
W5-647	S45°06'53"W	91.35'
W5-648	S55°07'32"W	39.50'
W5-649	S50°37'49"W	54.95'
W5-650	S50°55'22"W	62.69'
W5-651	S52°57'50"W	52.44'
W5-652	S55°38'22"W	118.10'
W5-653	S58°02'23"W	65.57'
W5-654	S56°41'43"W	78.92'
W5-655	S69°32'46"W	26.31'
W5-656	S62°37'10"W	156.60'
W5-657	S68°05'00"W	13.29'
W5-658	S63°10'03"W	91.58'
W5-659	S55°33'32"W	39.29'
W5-660	S74°28'40"W	13.09'
W5-661	S66°15'46"W	52.95'
W5-662	S71°02'29"W	15.33'
W5-663	S71°02'29"W	10.74'
W5-664	S62°53'47"W	65.72'
W5-665	S60°44'13"W	71.92'
W5-666	S60°44'13"W	59.57'
W5-667	S70°17'28"W	26.19'
W5-668	S59°55'53"W	65.61'
W5-669	S54°31'19"W	65.49'
W5-670	S57°09'06"W	39.60'
W5-671	S60°25'02"W	26.05'
W5-672	S55°07'41"W	39.50'
W5-673	S60°44'12"W	13.15'
W5-674	S66°51'29"W	26.19'
W5-675	S57°35'37"W	39.40'
W5-676	S64°25'52"W	26.39'
W5-677	S60°54'37"W	105.02'
W5-678	S59°07'25"W	65.49'
W5-679	[illegible]	[illegible]
W5-680	S44°22'47"W	26.21'
W5-681	S33°20'41"W	12.98'
W5-682	S26°42'05"W	25.94'
W5-683	S17°14'14"W	13.30'
W5-684	S10°23'39"W	25.86'
W5-685	S25°39'15"W	51.83'
W5-686	S20°34'18"W	52.29'
W5-687	S25°16'37"W	143.01'
W5-688	S21°36'44"W	26.13'
W5-689	S14°59'29"W	25.93'
W5-690	S23°06'07"W	13.00'
W5-691	S33°53'02"W	26.12'
W5-692	S26°21'12"W	26.27'
W5-693	S20°24'21"W	25.92'
W5-694	S38°23'28"W	78.29'
W5-695	S45°37'19"W	52.51'
W5-696	S57°42'07"W	26.12'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-697	S60°56'59"W	39.70'
W5-698	S78°38'48"W	26.30'
W5-699	S72°57'35"W	13.19'
W5-700	S61°56'31"W	65.98'
W5-701	S58°22'57"W	52.54'
W5-702	S56°01'25"W	90.34'
W5-703	S56°01'25"W	41.07'
W5-704	S49°12'46"W	130.98'
W5-705	S54°12'08"W	39.24'
W5-706	S46°45'36"W	125.56'
W5-707	S46°45'36"W	189.12'
W5-708	S51°45'20"W	77.73'
W5-709	S57°46'43"W	65.77'
W5-710	S60°44'31"W	26.30'
W5-711	S57°23'16"W	33.21'
W5-712	S58°05'55"W	85.30'
W5-713	S56°01'32"W	78.85'
W5-714	S63°35'12"W	52.84'
W5-715	S66°37'42"W	52.80'
W5-716	S70°30'57"W	26.46'
W5-717	S74°28'55"W	26.17'
W5-718	S15°37'06"W	26.01'
W5-719	S10°53'29"W	26.27'
W5-720	S01°36'29"W	51.71'
W5-721	S06°18'11"W	65.13'
W5-722	S11°02'06"W	25.91'
W5-723	S21°00'52"W	26.02'
W5-724	S30°51'59"W	52.25'
W5-725	S42°12'02"W	65.21'
W5-726	S13°14'55"W	91.04'
W5-727	S22°12'42"W	26.23'
W5-728	S34°46'39"W	65.11'
W5-729	S40°53'21"W	26.24'
W5-730	S46°25'06"W	26.10'
W5-731	S51°15'31"W	65.43'
W5-732	S62°44'28"W	13.23'
W5-733	N89°21'45"W	26.60'
W5-734	S82°34'50"W	12.99'
W5-735	S74°49'49"W	13.37'
W5-736	S64°49'07"W	37.91'
W5-737	N43°11'05"W	16.72'
W5-738	S63°35'42"W	192.69'
W5-739	N33°54'44"W	255.46
W5-740	N36°35'55"W	348.15'
W5-741	N62°58'57"W	399.02'
W5-742	S87°44'58"W	188.85'
W5-743	N41°11'54"W	937.07'
W5-744	N57°17'59"W	441.08'
W5-745	N19°41'25"W	296.50'
W5-746	N31°43'40"W	901.34'
W5-747	N48°42'45"W	547.18'
W5-748	N23°55'07"W	1794.93'
W5-749	N38°53'43"W	169.57'
W5-750	N04°07'11"E	307.74'
W5-751	N21°37'09"W	126.33'
W5-752	N02°10'57"E	3190.64'
W5-753	N48°53'11"E	126.51'
W5-754	N21°49'59"E	298.44'
W5-755	N05°13'13"W	420.75'
W5-756	N29°34'54"E	366.71'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-757	N79°27'50"E	84.05'
W5-758	N57°40'00"E	243.15'
W5-759	N17°39'29"E	345.11'
W5-760	N00°57'03"W	1362.14'
W5-761	N45°58'37"E	197.36'
W5-762	N08°45'06"E	228.14'
W5-763	N12°50'02"W	447.27'
W5-764	N49°15'33"E	222.52'
W5-765	N12°52'54"E	187.19'
W5-766	N03°41'39"W	559.94'
W5-767	N19°46'00"W	181.66'
W5-768	N57°51'27"W	667.79'
W5-769	S81°28'27"W	177.99'
W5-770	N41°55'57"W	513.02'
W5-771	N58°54'00"W	179.07'
W5-772	N74°44'14"W	759.93'
W5-773	N57°48'37"W	330.32'
W5-774	S89°34'04"W	813.17'
W5-775	N79°17'07"W	518.40'
W5-776	N29°36'29"W	1828.17'
W5-777	N43°32'57"W	304.82'
W5-778	N64°34'13"W	171.48'
W5-779	N32°42'12"W	656.28'
W5-780	N49°50'05"W	193.28'
W5-781	N86°32'12"W	274.16'
W5-782	N24°12'24"E	162.36'
W5-783	N05°10'33"W	170.11'
W5-784	N31°51'09"W	132.20'
W5-785	N08°59'38"E	115.67'
W5-786	N12°18'19"W	153.14'
W5-787	N46°03'35"W	226.95'
W5-788	N32°30'52"E	163.93'
W5-789	N01°45'33"E	183.81'
W5-790	N31°30'48"W	704.20'
W5-791	N60°08'54"W	1065.52'
W5-792	N60°38'29"W	176.94'
W5-793	N30°34'08"W	1017.52'
W5-794	N01°23'47"W	460.21'
W5-795	N20°49'18"W	462.72'
W5-796	N23°08'06"W	442.17'
W5-797	N41°15'31"W	204.11'
W5-798	N74°40'25"W	648.52'
W5-799	S72°47'22"W	505.59'
W5-800	S89°04'21"W	277.22'
W5-801	S55°18'59"W	178.61'
W5-802	S39°29'43"W	440.23'
W5-803	N60°31'56"W	130.39'
W5-804	N16°11'22"E	296.03'
W5-805	N03°40'28"W	513.01'
W5-806	N12°32'51"W	312.26'
W5-807	N28°07'30"E	64.32'
W5-808	N11°35'27"E	151.35'
W5-809	N19°13'09"W	361.54'
W5-810	N41°08'58"W	209.83'
W5-811	N66°37'21"W	289.06'
W5-812	S75°00'00"W	210.92'
W5-813	S35°39'26"W	230.79'
W5-814	S11°43'04"W	193.14'
W5-815	N79°16'41"W	366.23'
W5-816	N41°15'00"E	128.01'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-817	S87°38'47"E	50.38'
W5-818	N60°00'00"E	128.01'
W5-819	N30°00'00"E	210.92'
W5-820	N05°37'30"W	190.47'
W5-821	N37°12'02"W	520.84'
W5-822	N65°39'29"W	364.01'
W5-823	S76°52'30"W	149.00'
W5-824	S38°09'32"W	198.12'
W5-825	S54°22'30"W	231.13'
W5-826	N52°39'25"W	416.95'
W5-827	N59°59'22"W	397.97'
W5-828	N85°32'16"W	169.71'
W5-829	N53°10'45"W	260.51'
W5-830	N72°11'11"W	81.30'
W5-831	N30°02'55"E	498.11'
W5-832	N13°22'58"E	188.18'
W5-833	N14°50'40"W	455.07'
W5-834	N46°58'20"W	500.06'
W5-835	N68°44'27"W	315.32'
W5-836	N44°26'39"W	291.91'
W5-837	N79°47'39"W	212.66'
W5-838	S63°21'16"W	338.35'
W5-839	S40°21'58"W	109.54'
W5-840	N30°29'45"W	166.71'
W5-841	N45°08'16"W	165.86'
W5-842	N71°38'40"W	160.55'
W5-843	N06°54'03"W	174.91'
W5-844	N23°04'27"W	146.55'
W5-845	N49°54'57"W	477.18'
W5-846	N64°45'04"W	165.51
W5-847	N26°14'40"W	281.92'
W5-848	N19°13'10"E	169.01'
W5-849	N17°41'15"W	245.57'
W5-850	N54°54'35"W	489.18'
W5-851	N89°31'12"W	797.35'
W5-852	S53°12'56"W	240.69'
W5-853	S13°54'24"W	409.28'
W5-854	S68°27'32"W	320.65'
W5-855	N18°30'35"W	362.78'
W5-856	N43°18'33"W	513.93'
W5-857	N62°15'38"W	71.25'
W5-858	S89°57'35"W	935.61'
W5-859	N68°37'27"W	[illegible]
W5-860	N18°26'08"E	379.94'
W5-861	N20°19'37"W	529.60'
W5-862	N62°02'05"W	429.08'
W5-863	N86°32'15"W	267.13'
W5-864	S75°32'41"W	202.27'
W5-865	N46°10'56"W	417.30'
W5-866	S86°46'20"W	367.96'
W5-867	S52°30'00"W	169.83'
W5-868	N74°35'50"W	259.23'
W5-869	N84°18'14"W	487.97'
W5-870	S64°45'17"W	822.53'
W5-871	S38°40'15"W	219.65'
W5-872	N57°44'23"W	497.37'
W5-873	N75°48'07"W	358.34'
W5-874	N53°46'41"W	354.45'
W5-875	N85°56'15"W	275.00'
W5-876	S78°46'48"W	150.06'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-877	S49°47'00"W	543.10'
W5-878	S20°56'49"W	178.67'
W5-879	N80°05'14"W	76.08'
W5-880	N29°14'33"W	110.11'
W5-881	N51°12'28"W	200.82'
W5-882	N27°02'52"E	35.05'
W5-883	N59°30'52"E	238.11'
W5-884	N35°03'24"E	146.67'
W5-885	N56°16'25"E	136.51'
W5-886	N27°31'21"E	75.55'
W5-887	N46°06'42"E	41.62'
W5-888	N15°22'08"E	254.47'
W5-889	N44°27'31"W	377.61'
W5-890	N06°06'27"E	95.79'
W5-891	N16°38'13"E	213.43'
W5-892	N42°30'49"E	85.84'
W5-893	N24°46'38"E	113.24'
W5-894	N15°18'44"E	196.06'
W5-895	N37°25'13"E	257.53'
W5-896	N02°21'57"E	699.86'
W5-897	N46°08'11"W	67.13'
W5-898	N57°12'08"E	74.35'
W5-899	N42°42'58"E	435.59'
W5-900	N24°31'09"E	126.00'
W5-901	S59°37'17"E	63.56'
W5-902	N30°22'45"E	18.58'
W5-903	N16°03'28"W	29.42'
W5-904	N61°06'07"W	205.19'
W5-905	N66°12'49"W	241.99'
W5-906	N76°43'08"W	241.04'
W5-907	N08°11'13"E	37.23'
W5-908	S88°16'12"E	1407.24'
W5-909	S26°59'25"W	140.05'
W5-910	S63°00'35"E	106.43'
W5-911	S53°15'52"E	42.87'
W5-912	S67°18'52"E	237.75'
W5-913	S11°16'20"W	16.11'
W5-914	S26°49'42"E	363.82'
W5-915	S40°11'12"E	31.43'
W5-916	S81°02'09"E	18.46'
W5-917	S88°26'09"E	68.20'
W5-918	S44°08'15"E	376.92'
W5-919	S87°54'22"E	68.34'
W5-920	N86°08'57"E	245.26'
W5-921	N86°08'36"E	701.88'
W5-922	N84°00'43"E	423.17'
W5-923	N55°20'09"E	327.90'
W5-924	N28°19'08"E	278.17'
W5-925	N00°00'02"E	261.94'
W5-926	N22°27'12"W	268.34'
W5-927	S85°20'32"E	323.76'
W5-928	S58°07'02"E	242.36'
W5-929	S79°23'31"E	139.17'
W5-930	S07°57'44"W	323.66'
W5-931	S24°28'52"E	305.60'
W5-932	S55°37'43"E	298.10'
W5-933	S88°03'17"E	1696.26'
W5-934	N74°20'36"E	205.24'
W5-935	S77°56'42"E	506.78'
W5-936	N89°27'56"E	1045.60'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-937	N68°13'10"E	342.68'
W5-938	N40°22'10"E	271.03'
W5-939	N65°35'24"E	94.51'
W5-940	S75°12'44"E	363.85'
W5-941	N70°18'34"E	208.13'
W5-942	N30°13'30"E	713.23'
W5-943	N11°20'54"W	243.77'
W5-944	N38°12'03"W	433.47'
W5-945	N82°13'26"W	242.28'
W5-946	N01°13'29"W	97.13'
W5-947	N24°22'21"E	279.80'
W5-948	N03°12'48"E	236.61'
W5-949	N57°59'46"E	312.04'
W5-950	N22°19'00"E	286.52'
W5-951	N21°46'54"W	555.04'
W5-952	N71°30'41"W	564.72'
W5-953	N61°40'20"W	476.74'
W5-954	S86°22'12"W	272.36'
W5-955	N63°07'08"W	339.75'
W5-956	S88°36'37"W	535.96'
W5-957	N14°46'06"W	156.50'
W5-958	N42°41'00"W	345.16'
W5-959	N12°45'14"W	139.10'
W5-960	N40°54'30"W	210.15'
W5-961	N05°21'03"W	222.23'
W5-962	N48°28'31"W	304.44'
W5-963	N12°57'29"W	260.65'
W5-964	N66°38'59"E	207.91'
W5-965	N59°15'20"E	342.56'
W5-966	N25°55'14"E	157.58'
W5-967	N12°01'29"E	300.20'
W5-968	N04°16'08"E	295.70'
W5-969	N27°28'56"W	256.08'
W5-970	N38°57'22"W	289.55'
W5-971	N75°58'46"W	170.98'
W5-972	S66°41'16"W	108.18'
W5-973	N01°56'25"W	299.33'
W5-974	N20°10'39"E	191.01'
W5-975	N11°44'13"W	442.95'
W5-976	N40°58'45"W	523.16'
W5-977	N51°06'54"W	538.67'
W5-978	N68°46'23"W	390.87'
W5-979	N55°02'55"W	[illegible]
W5-980	N00°04'08"W	1018.37'
W5-981	N00°13'27"W	816.07'
W5-982	N50°27'30"E	759.26'
W5-983	N62°44'59"E	434.56'
W5-984	S83°43'38"E	473.55'
W5-985	S59°45'35"E	456.55'
W5-986	S88°44'28"E	289.39'
W5-987	N54°56'58"E	251.40'
W5-988	N22°04'51"E	1278.30'
W5-989	N06°08'48"W	567.50'
W5-990	N55°40'39"W	574.00'
W5-991	N71°03'20"W	552.40'
W5-992	N54°35'22"W	1184.35'
W5-993	N27°50'48"W	147.34'
W5-994	N01°03'04"E	120.74'
W5-995	N07°30'50"W	1024.64'
W5-996	N27°25'18"W	296.56'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-997	N08°45'46"W	201.85'
W5-998	N32°23'58"W	650.63'
W5-999	N16°28'17"W	318.21'
W5-1000	N37°31'57"W	815.22'
W5-1001	N51°40'46"E	304.64'
W5-1002	N14°15'08"E	185.61'
W5-1003	N02°10'45"W	138.04'
W5-1004	N35°26'01"E	231.73'
W5-1005	N03°33'37"E	329.35'
W5-1006	N32°22'19"W	356.98'
W5-1007	N74°34'45"W	372.67'
W5-1008	S75°31'17"W	316.74'
W5-1009	S40°08'16"W	308.67'
W5-1010	S76°26'40"W	83.04'
W5-1011	N66°50'36"W	278.24'
W5-1012	N49°51'37"W	161.64'
W5-1013	N28°59'36"W	299.28'
W5-1014	N48°27'31"W	344.66'
W5-1015	N13°50'41"W	352.11'
W5-1016	N35°01'43"W	549.61'
W5-1017	N56°50'41"W	245.94'
W5-1018	N38°34'28"W	299.20'
W5-1019	N73°04'52"W	360.78'
W5-1020	N13°10'17"E	527.92'
W5-1021	S74°13'30"E	521.27'
W5-1022	N73°29'19"E	434.45'
W5-1023	S80°48'50"E	264.36'
W5-1024	N64°35'17"E	606.20'
W5-1025	N23°38'54"E	402.76'
W5-1026	N13°44'46"W	555.74'
W5-1027	N40°45'50"W	638.23'
W5-1028	N00°02'51"W	127.57'
W5-1029	N20°04'44"W	248.48'
W5-1030	N28°55'49"E	651.26'
W5-1031	N14°44'33"E	160.82'
W5-1032	N16°16'30"W	834.13'
W5-1033	N54°57'18"W	569.63'
W5-1034	N01°10'13"E	144.61'
W5-1035	N28°43'22"W	731.41'
W5-1036	N62°51'28"W	451.87'
W5-1037	N42°28'12"W	188.34'
W5-1038	N66°54'40"W	161.33'
W5-1039	N33°34'28"W	33.33'
W5-1040	N24°53'01"E	528.30'
W5-1041	N00°00'36"W	216.86'
W5-1042	N25°51'08"E	169.57'
W5-1043	N05°38'15"E	226.73'
W5-1044	N16°26'49"W	269.40'
W5-1045	N43°12'33"W	325.43'
W5-1046	N07°34'41"E	545.08'
W5-1047	N07°52'50"W	369.07'
W5-1048	N31°55'51"W	113.84'
W5-1049	N86°33'33"E	378.71'
W5-1050	N65°39'59"E	221.97'
W5-1051	N32°39'04"E	303.95'
W5-1052	N67°05'00"E	391.98'
W5-1053	N46°55'01"E	603.58'
W5-1054	N27°49'43"E	400.50'
W5-1055	N71°58'27"E	507.51'
W5-1056	S81°10'10"E	675.44'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1057	N77°44'53"E	450.85'
W5-1058	S58°33'10"E	62.28'
W5-1059	S27°07'57"E	537.80'
W5-1060	S48°55'12"E	243.55'
W5-1061	N77°01'09"E	350.37'
W5-1062	N22°29'33"E	378.45'
W5-1063	N20°17'07"W	541.63'
W5-1064	N47°47'34"E	256.63'
W5-1065	N04°38'01"E	435.81'
W5-1066	N26°43'46"W	401.02'
W5-1067	N65°43'12"W	521.01'
W5-1068	S89°31'54"W	1574.86'
W5-1069	S70°04'16"W	841.80'
W5-1070	N88°24'56"W	665.36'
W5-1071	S73°07'58"W	207.68'
W5-1072	S54°40'53"W	310.44'
W5-1073	N78°46'33"W	146.05'
W5-1074	S84°25'48"W	189.59'
W5-1075	S67°38'09"W	429.19'
W5-1076	S88°04'05"W	376.89'
W5-1077	S73°56'55"W	160.07'
W5-1078	S45°30'46"W	1047.86'
W5-1079	S12°44'29"W	449.77'
W5-1080	S02°56'05"E	147.90'
W5-1081	S33°43'14"E	320.68'
W5-1082	S56°13'02"E	109.98'
W5-1083	S71°44'08"W	270.30'
W5-1084	N24°21'42"W	124.19'
W5-1085	N47°14'02"W	419.66'
W5-1086	N65°19'49"W	191.11'
W5-1087	S85°24'20"W	503.24'
W5-1088	N76°22'24"W	431.18'
W5-1089	N62°57'40"W	502.44'
W5-1090	S88°41'12"W	1254.06'
W5-1091	S68°07'32"W	142.13'
W5-1092	S55°59'17"W	328.58'
W5-1093	N37°08'48"W	150.34
W5-1094	N56°59'29"W	447.36'
W5-1095	N00°12'51"W	212.58'
W5-1096	N09°21'29"E	109.52'
W5-1097	N27°50'08"E	111.56'
W5-1098	S74°12'34"E	8.86'
W5-1099	N32°39'33"E	73.31'
W5-1100	S79°08'29"E	31.90'
W5-1101	N32°24'42"E	116.05'
W5-1102	N33°01'59"W	65.96'
W5-1103	N32°24'45"E	120.27'
W5-1104	S87°22'16"E	43.33'

W5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1105	N80°46'45"E	47.72'
W5-1106	N11°42'39"E	63.31'
W5-1107	N02°27'43"W	69.83'
W5-1108	N75°29'02"W	61.52'
W5-1109	N81°47'29"W	36.59'
W5-1110	N28°33'42"W	494.76'
W5-1111	N05°52'56"W	177.63'
W5-1112	N84°12'44"W	82.96'
W5-1113	N28°33'44"W	228.37'
W5-1114	N37°57'18"E	30.45'
W5-1115	N11°52'19"E	70.17'
W5-1116	N39°54'23"W	75.64'
W5-1117	N24°25'16"W	24.64'
W5-1118	N39°48'22"W	49.11'
W5-1119	N79°24'23"W	9.84'
W5-1120	N28°53'17"W	89.54'
W5-1121	N13°51'35"E	11.78'
W5-1122	N41°34'38"W	84.74'
W5-1123	N47°39'04"W	36.09'
W5-1124	N28°43'47"E	8.95'
W5-1125	N15°34'22"W	65.40'
W5-1126	N28°00'49"W	66.96'
W5-1127	N77°44'25"W	7.43'
W5-1128	N25°02'30"W	93.45'
W5-1129	N16°43'04"E	24.45'
W5-1130	N49°27'20"W	82.06'
W5-1131	S24°55'42"W	58.74'
W5-1132	S63°05'58"W	11.00'
W5-1133	S26°54'05"E	22.22'
W5-1134	S51°16'15"W	413.55'
W5-1135	N39°26'11"W	400.94'
W5-1136	N19°03'58"E	336.02'
W5-1137	N36°34'48"E	357.02'
W5-1138	N06°07'14"W	518.21'
W5-1139	N31°12'37"W	130.18'
W5-1140	N59°47'34"W	716.68'
W5-1141	N39°00'00"E	652.46'
W5-1142	S14°14'10"E	8.42'
W5-1143	N75°45'52"E	29.97'
W5-1144	N01°15'28"E	23.35'
W5-1145	N75°44'22"E	23.78'
W5-1146	N14°15'37"W	30.72'
W5-1147	N38°58'59"E	05.52'
W5-1148	N51°59'08"W	421.97'
W5-1149	N76°00'28"W	5.59'
W5-1150	N46°33'37"E	2.81
W5-1151	N46°37'43"E	553.19'
W5-1152	S43°51'45"E	45.71'

Book 938
Pgs 18-23

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: **TOWILL** Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 16 OF 21

#18.

W5 LINE TABLE		
LINE	BEARING	DISTANCE
W5-1153	N46°59'13"E	60.00'
W5-1154	N43°52'19"W	46.08'
W5-1155	N46°52'34"E	1493.85'
W5-1156	N24°05'25"W	635.06'
W5-1157	N56°34'09"E	65.87'
W5-1158	N24°05'12"W	101.79'
W5-1159	N56°33'44"E	55.12'
W5-1160	N33°26'16"W	18.45'
W5-1161	S88°38'30"W	61.49'
W5-1162	S29°35'48"W	40.34'
W5-1163	N49°31'45"W	694.02'
W5-1164	N45°01'07"W	36.34'
W5-1165	N53°39'58"W	41.98'
W5-1166	N23°39'04"W	384.29'
W5-1167	N15°09'33"E	49.27'
W5-1168	N04°58'45"E	17.81'
W5-1169	N52°59'24"W	30.85'
W5-1170	N63°01'13"W	38.30'
W5-1171	N23°39'08"W	14.35'
W5-1172	N17°34'19"E	41.73'
W5-1173	N23°39'09"W	67.69'
W5-1174	N81°31'20"W	32.47'
W5-1175	N23°39'01"W	42.96'
W5-1176	N29°43'57"E	15.50'
W5-1177	N44°08'28"E	29.45'
W5-1178	N21°17'57"E	31.86'
W5-1179	N23°45'37"W	14.46'
W5-1180	S66°14'23"W	37.51'
W5-1181	N08°14'14"E	950.78'
W5-1182	N26°16'25"E	549.43'
W5-1183	N02°56'07"W	313.41'
W5-1184	N27°11'56"W	224.87'
W5-1185	N65°33'39"W	521.94'
W5-1186	S66°32'04"W	325.21'
W5-1187	N66°37'24"W	312.44'
W5-1188	S65°26'07"W	244.06'
W5-1189	S30°47'24"W	385.64'
W5-1190	S76°57'24"W	341.46'
W5-1191	S41°12'21"W	293.61'
W5-1192	S74°22'53"W	376.32'
W5-1193	S44°00'42"W	305.20'
W5-1194	N80°20'15"W	127.25'
W5-1195	S75°09'57"W	150.85'
W5-1196	S47°11'32"W	548.83'
W5-1197	N26°43'39"W	223.54'
W5-1198	N46°40'18"W	148.61'
W5-1199	N08°14'30"W	312.59'
W5-1200	N45°26'50"W	308.79'
W5-1201	N03°01'11"W	349.29'
W5-1202	N27°37'51"W	296.22'
W5-1203	N48°25'23"W	378.93'
W5-1204	N71°52'51"W	122.91'
W5-1205	N02°11'34"E	241.42'
W5-1206	N11°25'21"W	154.46'
W5-1207	N37°48'05"W	501.51'
W5-1208	N02°36'15"W	351.85'
W5-1209	N30°37'01"W	454.72'
W5-1210	N00°14'16"W	182.10'
W5-1211	N28°57'53"W	142.91'
W5-1212	N05°05'47"E	62.48'

W5 LINE TABLE		
LINE	BEARING	DISTANCE
W5-1213	N48°57'18"E	331.95'
W5-1214	N22°23'34"E	673.02'
W5-1215	N05°18'49"W	126.58'
W5-1216	N32°23'01"W	333.92'
W5-1217	N04°16'39"E	167.12'
W5-1218	N68°32'03"E	248.69'
W5-1219	N31°56'27"E	477.11'
W5-1220	N04°10'04"E	780.24'
W5-1221	N14°15'56"W	464.76'
W5-1222	N60°39'03"W	583.37'
W5-1223	S83°10'36"W	669.98'
W5-1224	S46°17'28"W	435.70'
W5-1225	N89°03'25"W	260.05'
W5-1226	S74°33'50"W	185.03'
W5-1227	S57°20'07"W	313.30'
W5-1228	S33°30'04"W	170.18'
W5-1229	S03°05'42"W	420.08'
W5-1230	N73°11'23"W	462.24'
W5-1231	S67°53'29"W	441.47'
W5-1232	S27°57'55"W	422.03'
W5-1233	S00°42'13"W	460.00'
W5-1234	S19°32'02"E	600.25'
W5-1235	S26°55'16"W	69.54'
W5-1236	N28°37'56"W	211.82'
W5-1237	N58°03'09"W	192.63'
W5-1238	N75°07'26"W	215.29'
W5-1239	N16°57'13"W	203.43'
W5-1240	N34°46'52"W	200.59'
W5-1241	N72°50'22"W	227.20'
W5-1242	S68°42'40"W	310.81'
W5-1243	N86°50'15"W	141.74'
W5-1244	N06°24'31"W	502.66'
W5-1245	N41°15'24"W	402.88'
W5-1246	N21°15'31"E	277.48'
W5-1247	N14°50'08"W	256.74'
W5-1248	N58°42'02"E	258.50'
W5-1249	N31°16'20"E	200.82'
W5-1250	N17°02'54"E	140.41'
W5-1251	N06°05'16"W	186.98'
W5-1252	S83°51'25"E	209.00'
W5-1253	S42°51'48"E	307.49'
W5-1254	S86°30'38"E	366.62'
W5-1255	N64°26'42"E	484.21'
W5-1256	N34°49'02"E	697.06'
W5-1257	N33°46'29"E	299.96'
W5-1258	S83°45'50"E	240.77'
W5-1259	S87°00'08"E	126.53'
W5-1260	N76°50'21"E	124.50'
W5-1261	S59°58'47"E	518.90'
W5-1262	S84°50'34"E	1045.84'
W5-1263	N85°58'38"E	1297.37'
W5-1264	N80°45'41"E	425.47'
W5-1265	N80°45'41"E	1162.38'
W5-1266	N66°06'29"E	1559.35'
W5-1267	N43°43'35"E	1140.17'
W5-1268	N43°43'34"E	173.75'
W5-1269	N43°38'48"E	196.37'
W5-1270	N43°38'49"E	1486.62'
W5-1271	N44°26'10"E	1387.22'
W5-1272	N40°47'20"E	1128.87'

W5 LINE TABLE		
LINE	BEARING	DISTANCE
W5-1273	N40°47'20"E	781.27'
W5-1274	N46°16'53"E	1342.78'
W5-1275	N44°45'33"E	225.80'
W5-1276	N44°45'32"E	1142.43'
W5-1277	N44°45'27"E	5.76'
W5-1278	N44°45'32"E	514.80'
W5-1279	N42°47'47"E	296.10'

Book
938
/
Pgs
19-23

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

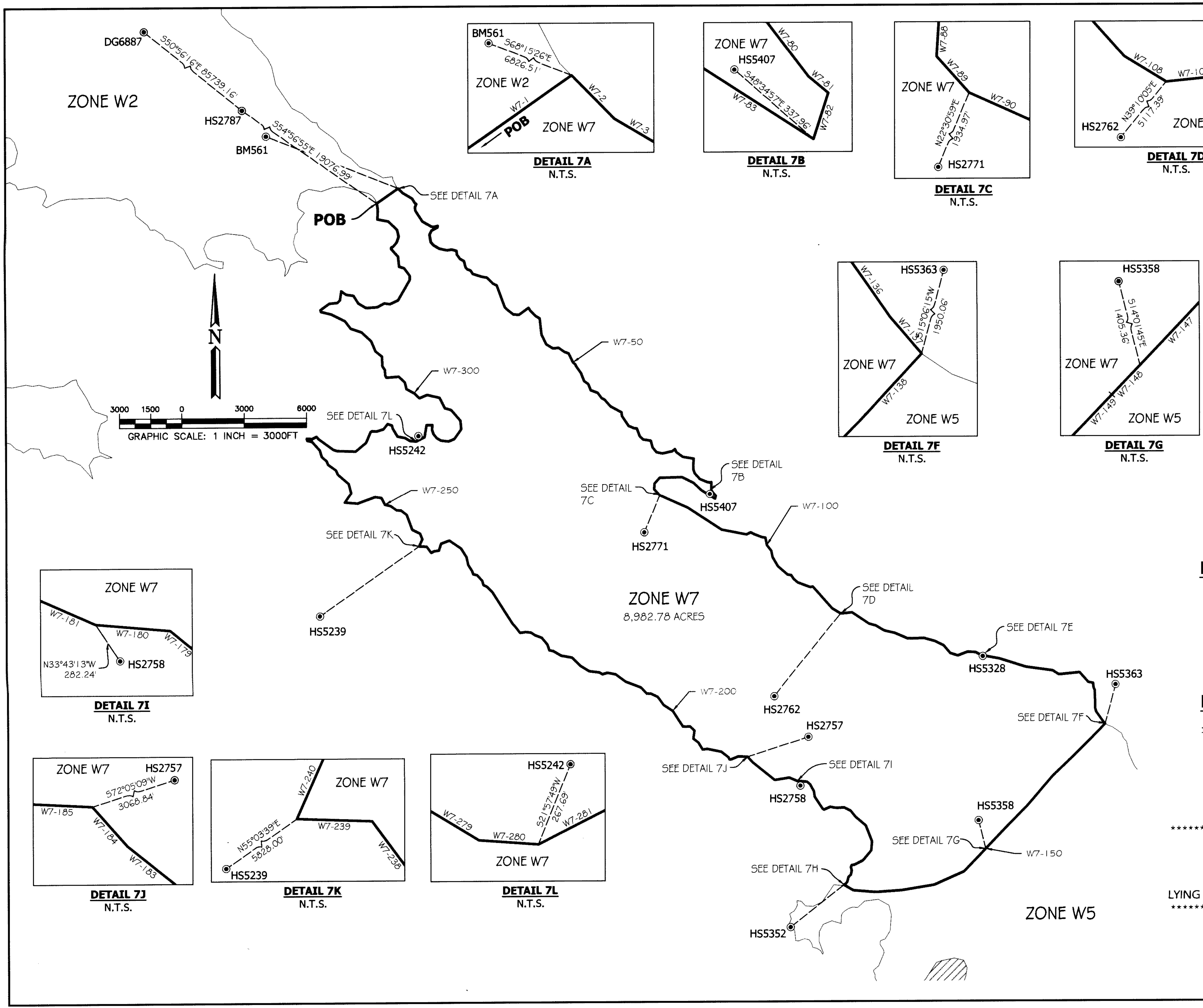
SCALE: NO SCALE FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 17 OF 21

19.



LEGEND

● - NGS / SCVWD MONUMENT
– – – – - GPS VECTOR (GRID TIE)
—— - SCVWD ZONE W7

NOTE

1. LINE TABLE SHOWN ON SHEET 19 REPRESENTS THE COURSES OF ZONE W7 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN.

RECORD OF SURVEY

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W7

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

SHEET 18 OF 21

Book 938
Pgs. 20-23

#20.

W7 LINE TABLE

LINE	BEARING	DISTANCE
W7-1	N54°53'58"E	1256.28'
W7-2	S44°19'07"E	293.80'
W7-3	S59°19'19"E	534.65'
W7-4	S31°06'28"E	251.83'
W7-5	S55°57'14"E	84.57'
W7-6	S22°30'00"W	169.83'
W7-7	S07°30'00"E	169.83'
W7-8	S32°28'51"E	615.92'
W7-9	S60°15'39"E	512.26'
W7-10	S80°37'30"E	106.89'
W7-11	N73°07'30"E	190.48'
W7-12	S07°35'47"W	74.24'
W7-13	S6[illegible]°58'08"W	3[illegible]4.50'
W7-14	S28°52'44"W	214.95'
W7-15	S10°31'18"E	372.71'
W7-16	S41°47'17"E	202.66'
W7-17	S59°46'44"E	339.98'
W7-18	S77°14'15"E	363.55'
W7-19	N79°27'27"E	223.54'
W7-20	S73°39'04"E	250.80'
W7-21	S03°45'00"E	169.83'
W7-22	S35°53'04"E	262.31'
W7-23	S60°05'41"E	209.89'
W7-24	S14°41'16"E	308.36
W7-25	S41°15'00"E	128.01'
W7-26	S67°30'00"E	169.83'
W7-27	S31°46'20"E	192.49
W7-28	S72°04'06"E	441.19'
W7-29	S79°42'56"E	251.00'
W7-30	S45°27'21"E	399.21
W7-31	S64°22'51"E	212.69'
W7-32	S19°36'50"E	1119.13'
W7-33	S43°57'50"E	163.80'
W7-34	S51°22'55"E	397.19'
W7-35	S89°58'05"E	254.17'
W7-36	N54°36'21"E	568.05'
W7-37	S32°32'22"E	194.40
W7-38	S45°34'26"E	341.04'
W7-39	S60°26'54"E	207.97'
W7-40	S06°11'17"E	786.96'
W7-41	S25°26'20"E	518.80'
W7-42	S58°35'0[illegible]"E	388.62
W7-43	N82°38'42"E	265.42'
W7-44	S55°03'01"E	348.77'
W7-45	S70°23'31"E	203.40
W7-46	S25°15'43"E	487.77'
W7-47	S52°56'13"E	128.63'
W7-48	S24°17'34"E	134.85
W7-49	S36°10'07"E	376.86'
W7-50	S20°43'22"E	416.69'
W7-51	S53°16'53"E	251.30'
W7-52	S21°33'28"E	312.80'
W7-53	S68°22'15"E	356.78
W7-54	S37°31'38"E	318.11'
W7-55	S62°19'49"E	157.31'
W7-56	S40°51'45"E	434.63'
W7-57	S61°59'11"E	596.20
W7-58	S06°51'24"E	185.57'
W7-59	S33°58'15"E	580.77'
W7-60	S67°41'19"E	303.90'

W7 LINE TABLE

LINE	BEARING	DISTANCE
W7-61	S88°52'29"E	109.29'
W7-62	S19°43'55"E	386.22'
W7-63	S42°58'34"E	231.58'
W7-64	S80°38'19"E	382.19'
W7-65	S14°28'06"E	330.79'
W7-66	S39°25'48"E	295.69'
W7-67	S76°47'33"E	285.66'
W7-68	N76°48'37"E	487.63'
W7-69	N52°16'44"E	170.48'
W7-70	S22°32'07"E	167.73'
W7-71	S53°50'13"E	385.28'
W7-72	S80°36'55"E	531.67'
W7-73	S05°43'30"W	272.29'
W7-74	S02°26'27"E	264.72'
W7-75	S18°13'19"E	178.45'
W7-76	S41°45'59"E	373.88'
W7-77	S67°47'03"E	429.30'
W7-78	N85°06'38"E	151.00'
W7-79	S01°07'18"W	388.26'
W7-80	S37°18'29"E	267.26'
W7-81	S50°08'27"E	82.99'
W7-82	S17°54'43"W	155.10'
W7-83	N57°04'36"W	778.57'
W7-84	N46°55'02"W	512.47'
W7-85	N63°09'45"W	614.85'
W7-86	S88°35'03"W	1078.66'
W7-87	S41°44'00"W	361.95'
W7-88	S03°36'31"W	282.81'
W7-89	S41°35'28"E	391.19'
W7-90	S65°42'13"E	1480.73'
W7-91	S56°57'12"E	1945.58'
W7-92	S78°41'12"E	1205.08'
W7-93	N62°53'28"E	227.67'
W7-94	S63°06'55"E	203.67'
W7-95	S68°36'09"E	395.81'
W7-96	S82°57'53"E	162.76'
W7-97	S10°16'12"E	369.73'
W7-98	S38°41'58"E	345.02'
W7-99	S10°37'27"E	302.67'
W7-100	S29°53'09"E	515.16'
W7-101	S49°40'46"E	629.01'
W7-102	S50°[illegible]5'50"E	[illegible]69.28'
W7-103	S33°08'30"E	230.52'
W7-104	S50°53'56"E	244.82'
W7-105	S69°20'31"E	634.18'
W7-106	N82°37'57"E	135.78'
W7-107	S41°34'43"E	1400.71'
W7-108	S58°37'51"E	471.89'
W7-109	N84°21'03"E	554.02'
W7-110	S55°40'57"E	982.19'
W7-111	S75°31'52"E	351.76'
W7-112	S57°35'02"E	269.63'
W7-113	S62°22'44"E	215.77'
W7-114	S76°40'14"E	503.57'
W7-115	S66°51'03"E	677.16'
W7-116	N88°19'34"E	773.62'
W7-117	S74°10'10"E	573.92'
W7-118	S62°45'18"E	448.80'
W7-119	S40°06'35"E	483.15'
W7-120	S72°09'26"E	380.44'

W7 LINE TABLE

LINE	BEARING	DISTANCE
W7-121	N69°45'24"E	504.45'
W7-122	S87°20'54"E	392.76'
W7-123	S61°28'19"E	316.66'
W7-124	S79°48'21"E	871.35'
W7-125	S72°12'13"E	1340.62'
W7-126	S82°05'34"E	1307.58'
W7-127	S57°33'16"E	343.06'
W7-128	N84°35'08"E	1001.65'
W7-129	S41°21'42"E	624.98'
W7-130	S78°53'17"E	225.22'
W7-131	S04°29'59"E	220.18'
W7-132	S24°08'55"E	130.72'
W7-133	S00°28'16"E	43[illegible]13'
W7-134	S00°28'16"E	426.84'
W7-135	S17°37'10"E	193.47'
W7-136	S34°46'04"E	558.43
W7-137	S40°26'42"E	153.60'
W7-138	S42°47'47"W	296.10'
W7-139	S44°45'32"W	514.80'
W7-140	S44°45'27"W	5.76'
W7-141	S44°45'32"W	1142.43'
W7-142	S44°45'33"W	225.80'
W7-143	S46°16'53"W	1342.78'
W7-144	S40°47'20"W	781.27'
W7-145	S40°47'20"W	1128.87'
W7-146	S44°26'10"W	1387.22'
W7-147	S43°38'49"W	1486.62'
W7-148	S43°38'48"W	196.37'
W7-149	S43°43'34"W	173.75'
W7-150	S43°43'35"W	1140.17'
W7-151	S66°06'29"W	1559.35
W7-152	S80°45'41"W	1162.38'
W7-153	S80°45'41"W	425.47'
W7-154	S85°58'38"W	1297.37'
W7-155	N84°50'34"W	1045.84'
W7-156	N59°58'47"W	516.91'
W7-157	N55°16'53"E	105.00
W7-158	N37°08'25"E	114.36'
W7-159	N14°29'09"E	224.01'
W7-160	N43°18'37"E	164.99'
W7-161	N14°07'14"E	206.51'
W7-162	N[illegible]5°27'02"W	164.9[illegible]
W7-163	N19°27'09"E	103.46
W7-164	N79°26'13"E	152.36'
W7-165	N61°55'00"E	443.86'
W7-166	N39°27'07"E	621.89'
W7-167	N05°33'37"E	431.95'
W7-168	N21°26'48"W	827.64'
W7-169	N50°03'05"W	631.42
W7-170	N37°58'40"W	372.88'
W7-171	N62°27'17"W	356.45'
W7-172	S87°11'31"W	413.86'
W7-173	N78°28'35"W	265.44'
W7-174	S66°18'03"W	331.51'
W7-175	N51°55'40"W	68.51
W7-176	N33°36'11"W	696.42'
W7-177	N08°08'10"W	269.16'
W7-178	N28°53'54"W	383.26'
W7-179	N50°26'27"W	191.24'
W7-180	N84°57'23"W	481.28'

W7 LINE TABLE

LINE	BEARING	DISTANCE
W7-181	N66°03'24"W	403.06'
W7-182	S81°01'42"W	715.14'
W7-183	N51°14'03"W	1376.69'
W7-184	N41°18'00"W	338.67'
W7-185	N87°04'43"W	450.27'
W7-186	S68°03'55"W	400.47'
W7-187	N88°51'51"W	52.98'
W7-188	N26°35'16"W	126.06'
W7-189	N51°54'17"W	421.26'
W7-190	N78°06'59"W	698.20'
W7-191	S81°21'45"W	218.91'
W7-192	N30°56'20"W	393.03'
W7-193	N53°33'26"W	312.64'
W7-194	N09°08'29"E	399.49'
W7-195	N48°01'42"W	297.75'
W7-196	S87°07'56"W	327.63'
W7-197	N32°58'01"W	913.88'
W7-198	N56°51'21"W	522.08'
W7-199	N35°36'37"W	478.70'
W7-200	N64°09'48"W	371.05'
W7-201	S86°52'35"W	184.02'
W7-202	N43°07'11"W	406.11'
W7-203	N68°51'35"W	771.17'
W7-204	N53°15'54"W	592.46'
W7-205	N78°39'57"W	422.03'
W7-206	S72°38'19"W	243.19'
W7-207	N56°16'25"W	163.94'
W7-208	N83°07'00"W	496.93'
W7-209	N58°25'24"W	522.55'
W7-210	N43°49'44"W	532.45'
W7-211	N79°54'55"W	528.35'
W7-212	N60°13'53"W	443.29'
W7-213	N77°49'40"W	198.37'
W7-214	N18°48'11"W	300.29'
W7-215	N40°04'40"W	416.35'
W7-216	N69°38'48"W	344.42'
W7-217	N55°37'38"W	231.08'
W7-218	N83°53'04"W	266.52'
W7-219	S82°23'35"W	278.03'
W7-220	N36°21'46"W	298.09'
W7-221	N40°47'43"W	279.55'
W7-222	N32°29'30"W	436.66
W7-223	N32°05'40"W	345.70'
W7-224	N44°43'46"W	386.94'
W7-225	N66°24'26"W	171.20'
W7-226	N15°02'02"W	222.69'
W7-227	N42°01'16"W	350.55'
W7-228	N75°50'41"W	205.38'
W7-229	N17°53'59"W	159.12'
W7-230	N31°58'07"W	354.34'
W7-231	N12°28'01"W	383.06'
W7-232	N32°01'02"W	494.10'
W7-233	N55°42'04"W	676.82'
W7-234	S69°19'02"W	417.44'
W7-235	S17°31'25"W	347.64'
W7-236	S82°21'42"W	232.61'
W7-237	S61°39'27"W	155.87'
W7-238	N36°20'46"W	366.09'
W7-239	N88°04'50"W	362.22'
W7-240	N23°55'46"E	377.69'

W7 LINE TABLE

LINE	BEARING	DISTANCE
W7-241	N20°34'08"W	288.52'
W7-242	N63°21'42"W	422.14'
W7-243	N19°40'48"W	768.32'
W7-244	N52°34'45"W	341.88'
W7-245	N88°55'51"W	204.95'
W7-246	N54°03'52"W	352.74'
W7-247	N75°39'31"W	290.58'
W7-248	N26°53'46"W	359.93'
W7-249	N81°28'48"W	311.15'
W7-250	S70°12'47"W	906.90'
W7-251	N84°57'37"W	615.36'
W7-252	N34°35'30"E	551.21'
W7-253	N14°33'42"W	463.36
W7-254	N48°50'16"W	685.74'
W7-255	N24°52'15"W	217.77'
W7-256	N54°25'46"W	465.76'
W7-257	N20°35'26"W	195.27'
W7-258	N49°39'27"W	301.52'
W7-259	N16°12'29"W	333.36'
W7-260	N42°11'13"W	554.91'
W7-261	N75°33'17"W	227.92
W7-262	N16°21'14"W	101.00'
W7-263	S86°05'23"E	254.70'
W7-264	N64°42'25"E	239.18'
W7-265	S40°56'41"E	146.13'
W7-266	S53°51'05"E	876.36'
W7-267	S70°26'03"E	187.27'
W7-268	S88°21'17"E	887.00'
W7-269	N51°13'26"E	662.72'
W7-270	N22°43'37"E	556.78'
W7-271	N58°12'25"E	86.18
W7-272	S86°25'17"E	215.65
W7-273	N73°21'21"E	346.88'
W7-274	N38°07'25"E	327.37'
W7-275	S71°00'01"E	216.89'
W7-276	S11°36'51"E	147.75'
W7-277	S31°11'25"E	459.87'
W7-278	S79°02'48"E	369.71'
W7-279	S58°37'09"E	276.00'
W7-280	S85°50'40"E	286.95'
W7-281	N63°04'25"E	447.37'
W7-282	N09°43'39"E	586.03
W7-283	N89°50'41"E	279.36'
W7-284	S04°11'06"W	235.20'
W7-285	S18°43'41"E	218.01'
W7-286	S38°08'00"E	239.76'
W7-287	S60°52'58"E	253.74
W7-288	S83°38'32"E	340.71
W7-289	N68°49'39"E	303.29'
W7-290	N35°12'53"E	579.74'
W7-291	N06°03'34"W	423.64'
W7-292	N40°52'06"W	662.31'
W7-293	N73°40'52"W	316.15'
W7-294	N26°48'29"W	563.70'
W7-295	N76°09'31"W	606.16'
W7-296	S66°42'30"W	401.43
W7-297	N45°17'56"W	347.12'
W7-298	N61°42'56"W	420.33'
W7-299	N13°59'26"W	342.45'
W7-300	N46°39'12"W	389.34'

W7 LINE TABLE

LINE	BEARING	DISTANCE
W7-301	S85°45'38"W	592.01'
W7-302	N27°08'34"W	128.07'
W7-303	N02°51'51"W	255.53'
W7-304	N32°36'07"W	215.66'
W7-305	N02°23'34"W	469.18'
W7-306	N51°33'40"W	392.73'
W7-307	N22°04'15"W	532.00'
W7-308	N47°24'54"W	622.30'
W7-309	N71°08'18"W	564.36'
W7-310	N36°45'37"W	451.48'
W7-311	N63°08'57"W	715.06'
W7-312	N76°09'21"W	523.11'
W7-313	N16°34'48"W	97.13'
W7-314	N54°56'08"E	349.80'
W7-315	N54°56'08"E	178.98'
W7-316	N83°58'41"E	383.01'
W7-317	N47°37'07"E	179.48'
W7-318	N07°57'28"E	446.34'
W7-319	S53°11'50"E	302.60'
W7-320	S81°53'02"E	346.55'
W7-321	S32°54'15"E	436.41'
W7-322	S59°06'59"E	435.74'
W7-323	N85°30'58"E	538.28'
W7-324	N62°13'52"E	377.76'
W7-325	S82°41'38"E	270.24'
W7-326	N65°31'37"E	429.61'
W7-327	N29°56'39"E	1133.35'
W7-328	N01°11'20"E	200.81'
W7-329	N35°59'17"W	450.16'
W7-330	N73°31'13"W	251.57'
W7-331	N05°15'10"W	487.19'
W7-332	N42°04'41"W	501.75'
W7-333	N05°32'54"E	62.41'
W7-334	N61°50'22"E	111.08'
W7-335	N39°34'36"E	248.59'
W7-336	N17°18'49"E	292.43'
W7-337	N13°15'30"W	333.74'
W7-338	N45°57'59"W	590.17'
W7-339	N79°45'39"W	520.43'
W7-340	N02°27'29"E	481.66'
W7-341	N10°19'41"W	230.28'
W7-342	N18°16'06"W	59.99'

Book 938

Pgs: 21-23

RECORD OF SURVEY

* * *

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W7

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

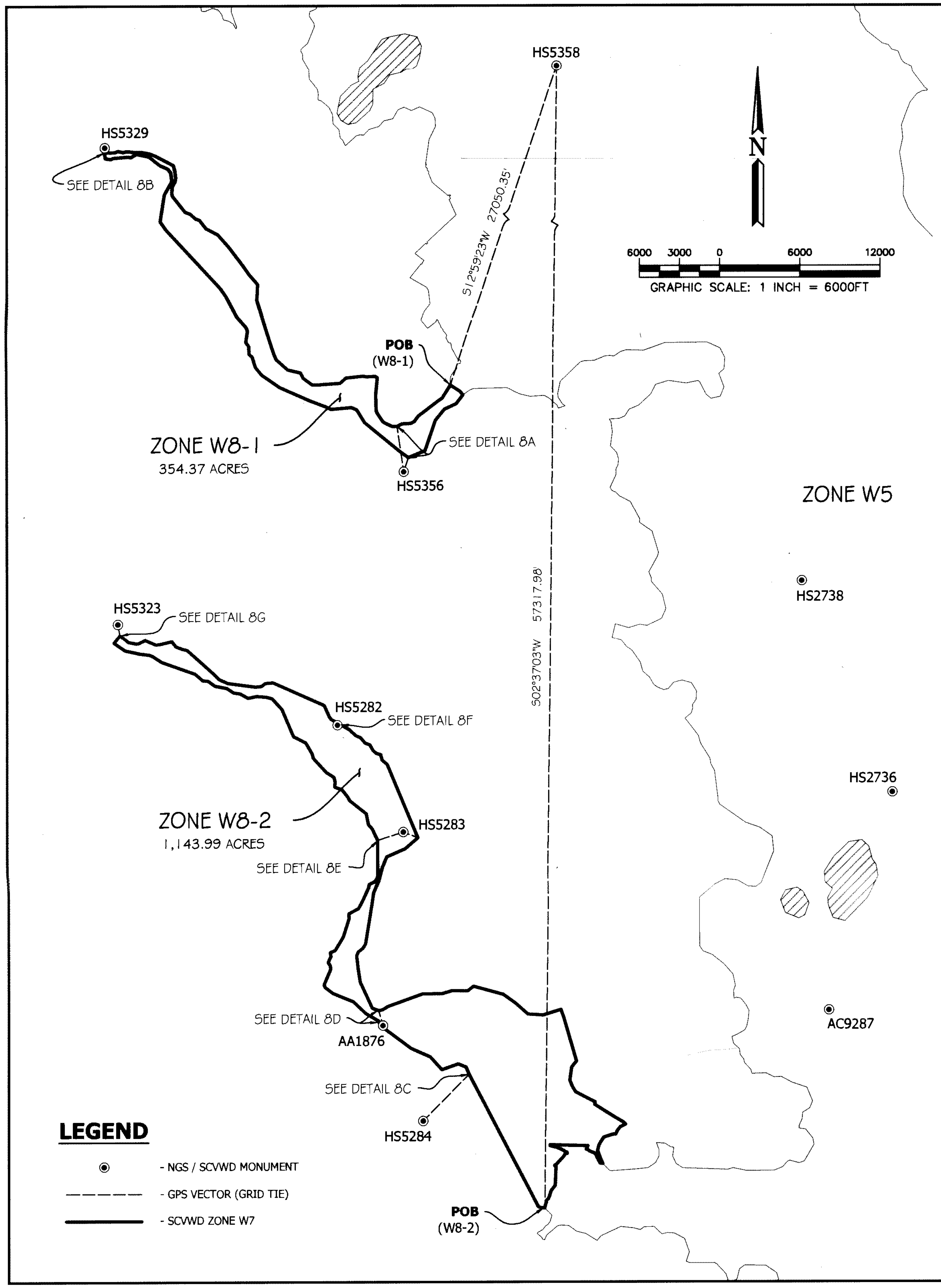
* * *

SCALE: NO SCALE FEBRUARY, 2020

BY: **TOWILL** Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

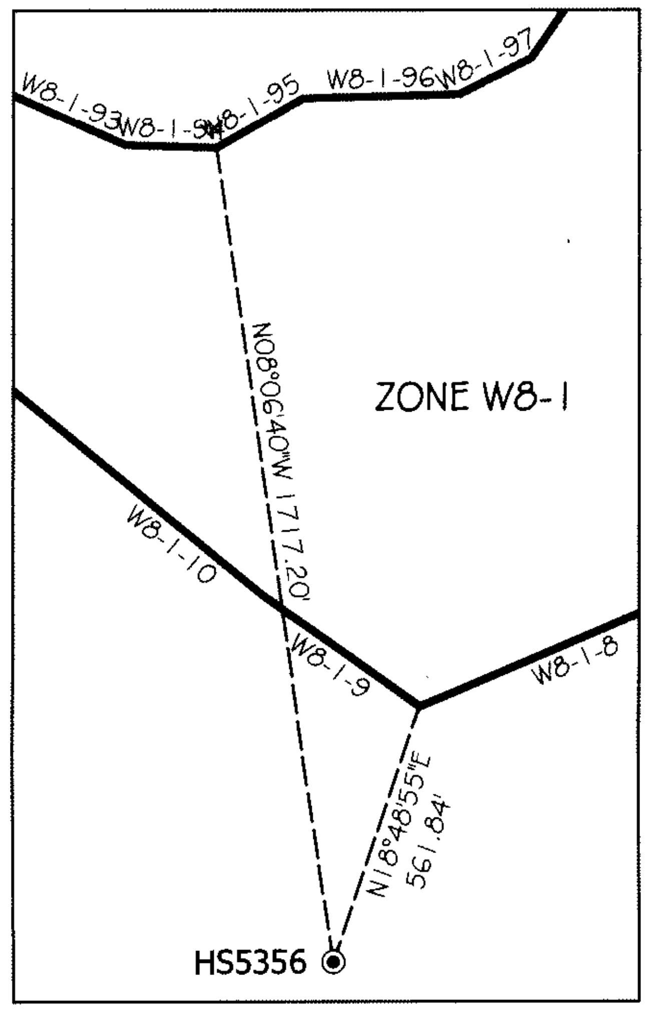
JOB NO. 16310

#21.

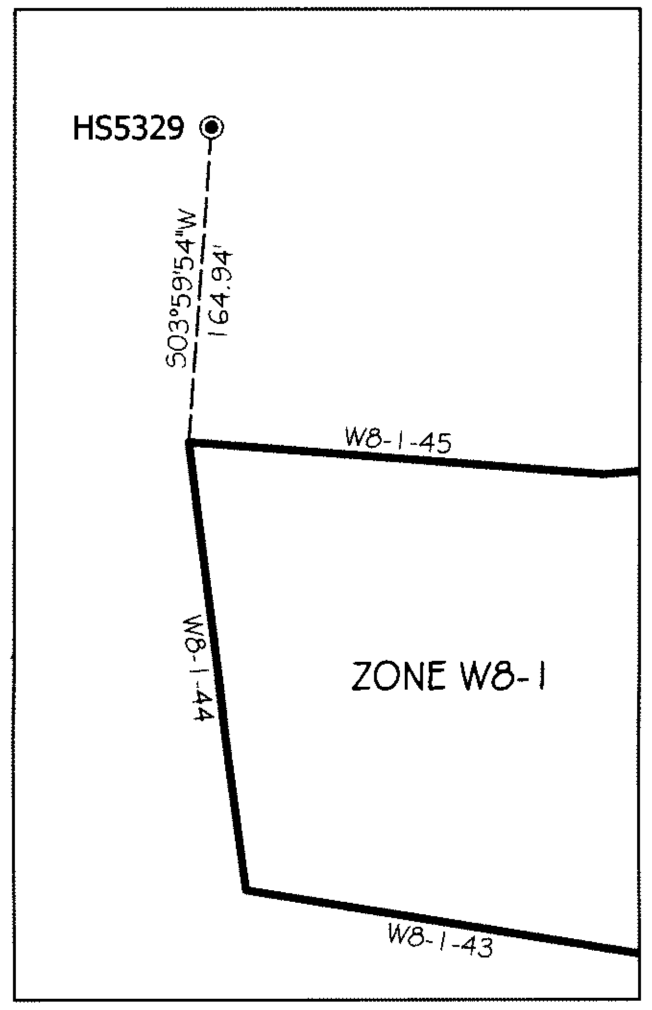


LEGEND

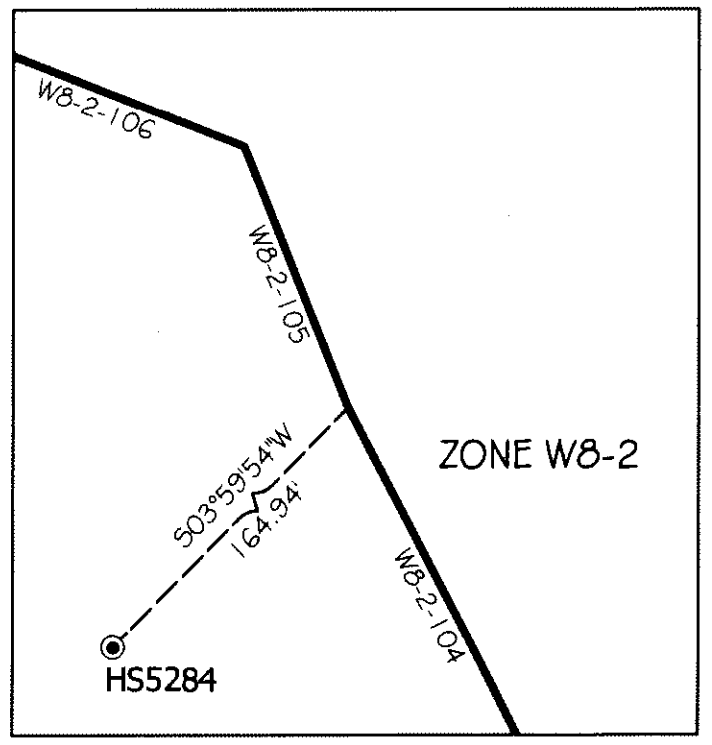
◉	- NGS / SCVWD MONUMENT
– – – – –	- GPS VECTOR (GRID TIE)
———	- SCVWD ZONE W7



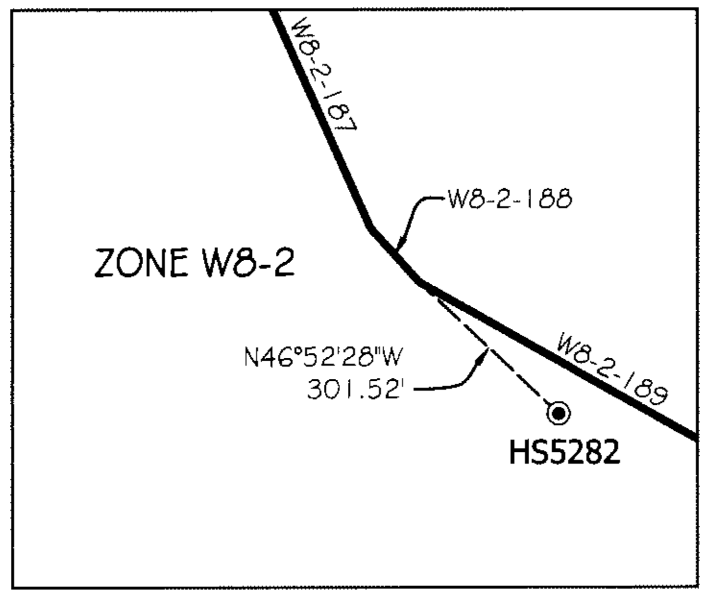
DETAIL 8A
N.T.S.



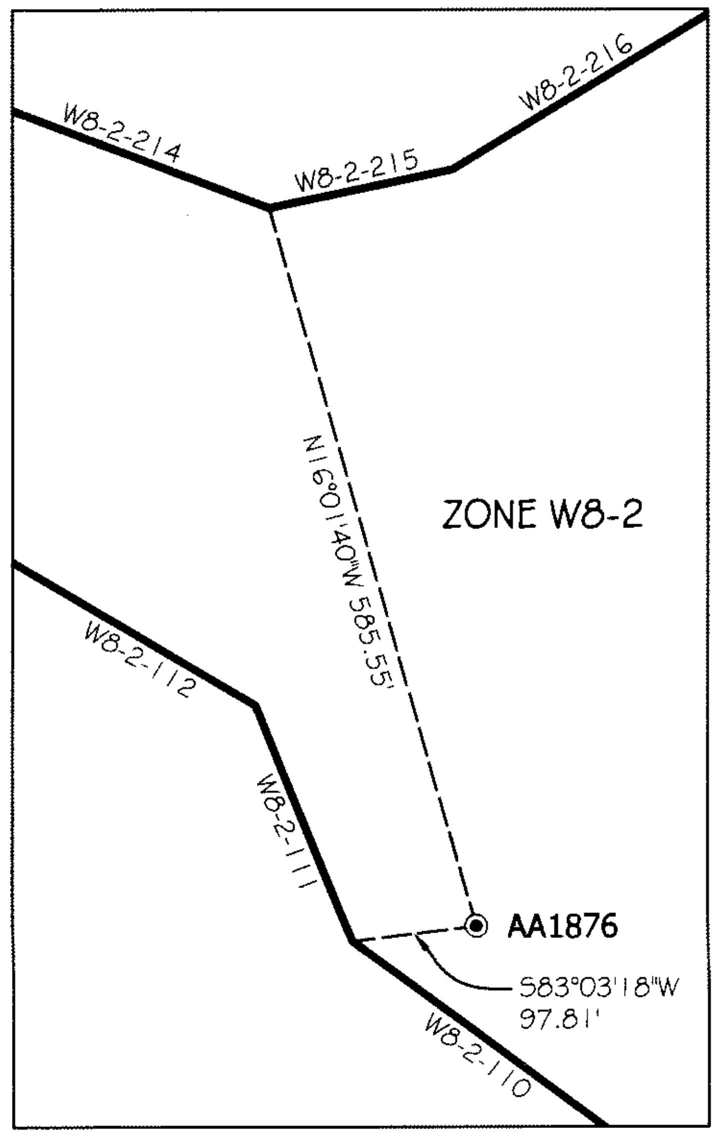
DETAIL 8B
N.T.S.



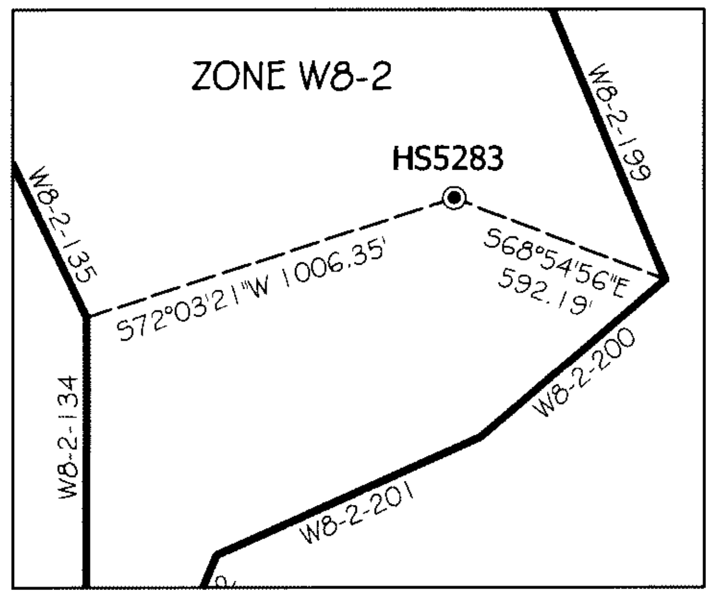
DETAIL 8C
N.T.S.



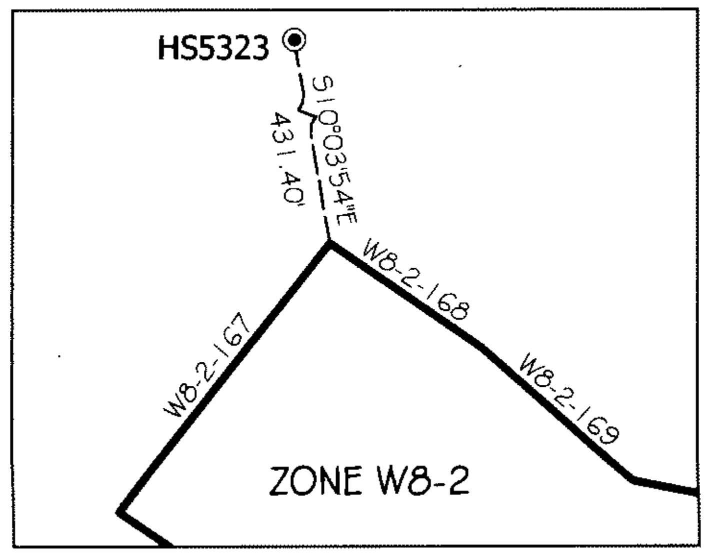
DETAIL 8F
N.T.S.



DETAIL 8D
N.T.S.



DETAIL 8E
N.T.S.



DETAIL 8G
N.T.S.

NOTE

1. LINE TABLE SHOWN ON SHEET 21 REPRESENTS THE COURSES OF ZONE W8-1 & W8-2 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN.

RECORD OF SURVEY

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

SHEET 20 OF 21

Book
938
Pgs:
22-23

#22.

W8-1 LINE TABLE		
LINE	BEARING	DISTANCE
W8-1-1	S56°59'29"E	447.36'
W8-1-2	S37°08'48"E	150.34'
W8-1-3	S37°08'48"E	0.60'
W8-1-4	S37°07'24"W	416.80'
W8-1-5	S65°29'26"W	487.87'
W8-1-6	S39°20'59"W	547.21'
W8-1-7	S18°52'36"W	1193.05'
W8-1-8	S67°00'08"W	675.91'
W8-1-9	N54°28'15"W	403.09'
W8-1-10	N50°28'28"W	1707.98'
W8-1-11	N31°10'57"W	560.84'
W8-1-12	N67°28'06"W	221.95'
W8-1-13	S84°58'13"W	764.50'
W8-1-14	N63°06'51"W	199.22'
W8-1-15	N69°25'06"W	655.04'
W8-1-16	N66°13'15"W	1231.65'
W8-1-17	N54°51'27"W	832.39'
W8-1-18	N38°49'38"W	367.92'
W8-1-19	N16°46'16"W	393.17'
W8-1-20	N46°32'30"W	162.93'
W8-1-21	N02°18'49"W	289.52'
W8-1-22	N34°05'09"W	198.53'
W8-1-23	N09°11'11"E	407.64'
W8-1-24	N18°01'16"W	142.54'
W8-1-25	N41°11'12"W	543.07'
W8-1-26	N28°42'41"W	876.39'
W8-1-27	N34°59'55"W	367.96'
W8-1-28	N42°25'40"W	244.08'
W8-1-29	N42°49'54"W	2757.97'
W8-1-30	N33°43'09"W	259.12'
W8-1-31	N33°45'00"W	113.30'
W8-1-32	N08°57'34"E	1025.89'
W8-1-33	N28°56'06"E	562.08'
W8-1-34	N06°57'51"W	344.58'
W8-1-35	N37°12'14"W	157.90'
W8-1-36	N66°24'38"W	328.87'
W8-1-37	N51°27'42"W	536.58'
W8-1-38	N77°40'26"W	466.46'
W8-1-39	S58°20'50"W	250.75'
W8-1-40	N76°21'37"W	86.05'
W8-1-41	S86°00'14"W	567.59'
W8-1-42	S64°44'40"W	109.77'
W8-1-43	N80°49'20"W	208.15'
W8-1-44	N07°17'57"W	235.79'
W8-1-45	S85°33'44"E	216.89'
W8-1-46	N85°48'20"E	179.51'
W8-1-47	N71°15'00"E	128.01'
W8-1-48	S77°06'10"E	178.28'
W8-1-49	N78°27'00"E	157.58'
W8-1-50	S83°20'23"E	228.81'
W8-1-51	S89°35'55"E	290.75'
W8-1-52	S79°41'43"E	291.15'
W8-1-53	S70°33'53"E	248.12'
W8-1-54	S61°59'54"E	781.00'
W8-1-55	S15°37'39"E	225.77'
W8-1-56	S07°07'30"E	251.95'
W8-1-57	S08°35'01"W	139.58'
W8-1-58	S30°11'06"W	209.05'
W8-1-59	S05°40'36"W	274.36'
W8-1-60	S16°52'30"E	106.89'

W8-1 LINE TABLE		
LINE	BEARING	DISTANCE
W8-1-61	S38°30'59"E	756.80'
W8-1-62	S70°04'26"E	205.80'
W8-1-63	S48°40'39"E	278.20'
W8-1-64	S73°07'30"E	149.00'
W8-1-65	S36°23'04"E	217.01'
W8-1-66	S38°06'52"E	182.37'
W8-1-67	S61°56'23"E	496.39'
W8-1-68	S41°55'06"E	601.36'
W8-1-69	S37°10'53"E	930.36'
W8-1-70	S33°22'46"E	362.11'
W8-1-71	S40°57'17"E	508.11'
W8-1-72	S02°54'42"W	589.73'
W8-1-73	S17°19'07"E	334.65
W8-1-74	S17°42'31"E	1738.13'
W8-1-75	S21°26'45"E	276.22'
W8-1-76	S48°37'25"E	575.90'
W8-1-77	S76°31'30"E	489.03'
W8-1-78	S28°32'01"E	226.28'
W8-1-79	S52°41'48"E	414.91'
W8-1-80	N89°39'37"E	277.50'
W8-1-81	N85°40'47"E	519.45'
W8-1-82	N86°15'00"E	251.10'
W8-1-83	N49°18'39"E	300.55'
W8-1-84	N83°43'48"E	638.96'
W8-1-85	S82°11'12"E	137.05
W8-1-86	N87°40'34"E	322.05'
W8-1-87	S56°35'34"E	102.22'
W8-1-88	S05°40'41"W	655.93'
W8-1-89	S01°16'53"E	577.41'
W8-1-90	S20°37'30"E	106.89'
W8-1-91	S33°21'23"E	379.11'
W8-1-92	S54°22'30"E	106.89'
W8-1-93	S65°46'35"E	280.00'
W8-1-94	S88°07'30"E	190.47'
W8-1-95	N60°05'30"E	208.00'
W8-1-96	N88°29'08"E	322.32'
W8-1-97	N63°45'00"E	169.83'
W8-1-98	N34°27'31"E	246.97'
W8-1-99	N53°02'22"E	923.68'
W8-1-100	N56°23'44"E	199.80'
W8-1-101	N32°13'50"E	578.91'

W8-2 LINE TABLE		
LINE	BEARING	DISTANCE
W8-2-102	N87°29'56"W	37.62'
W8-2-103	N79°23'16"W	199.43'
W8-2-104	N27°25'29"W	5628.92'
W8-2-105	N21°42'48"W	293.54
W8-2-106	N68°27'48"W	319.53'
W8-2-107	S70°33'13"W	646.96'
W8-2-108	N41°59'24"W	645.55'
W8-2-109	N65°56'44"W	788.90'
W8-2-110	N53°38'36"W	1433.42'
W8-2-111	N22°07'32"W	199.42'
W8-2-112	N59°23'45"W	559.41'
W8-2-113	N46°53'12"W	642.09'
W8-2-114	N67°51'48"W	325.77'
W8-2-115	N67°30'21"W	496.14
W8-2-116	N52°50'33"W	372.23'
W8-2-117	N19°39'38"W	109.04'
W8-2-118	N23°08'06"E	638.45
W8-2-119	N11°40'39"W	145.51'
W8-2-120	N35°25'52"W	124.48'
W8-2-121	N25°02'21"E	249.95'
W8-2-122	N08°57'11"W	154.60'
W8-2-123	N67°19'08"E	192.95'
W8-2-124	N31°24'49"E	593.98'
W8-2-125	N17°33'41"E	713.50'
W8-2-126	N00°22'22"W	190.00'
W8-2-127	N61°21'36"E	410.29
W8-2-128	N29°04'46"E	252.69'
W8-2-129	N25°34'24"E	613.80'
W8-2-130	N13°58'08"E	131.40'
W8-2-131	N62°55'26"E	248.22'
W8-2-132	N35°26'41"E	153.41'
W8-2-133	N11°14'21"E	121.66'
W8-2-134	N00°03'15"E	1292.31'
W8-2-135	N25°44'08"W	488.14'
W8-2-136	N43°00'09"W	190.63'
W8-2-137	N11°10'09"W	424.70'
W8-2-138	N51°33'39"W	795.71'
W8-2-139	N25°44'40"W	135.81'
W8-2-140	N39°25'38"W	376.76'
W8-2-141	N70°42'06"W	283.05'
W8-2-142	N02°12'31"E	209.26'
W8-2-143	N12°14'54"W	163.82'
W8-2-144	N58°10'23"W	342.53
W8-2-145	N42°05'27"W	718.68'
W8-2-146	N14°51'28"W	172.24'
W8-2-147	N31°06'04"W	477.13'
W8-2-148	N62°19'50"W	520.07'
W8-2-149	N23°08'00"W	1109.17'
W8-2-150	N42°05'50"W	551.56'
W8-2-151	N75°15'44"W	219.92'
W8-2-152	N85°16'18"W	362.14'
W8-2-153	S78°23'32"W	340.00'
W8-2-154	N60°14'58"W	334.65'
W8-2-155	N81°38'43"W	252.98'
W8-2-156	N55°35'59"W	295.94
W8-2-157	N79°01'44"W	457.67
W8-2-158	N53°45'34"W	312.59
W8-2-159	N83°48'24"W	205.66'
W8-2-160	N49°55'33"W	374.55'
W8-2-161	N70°20'29"W	1338.19'

W8-2 LINE TABLE		
LINE	BEARING	DISTANCE
W8-2-162	N56°23'27"W	398.01'
W8-2-163	N68°59'24"W	143.13'
W8-2-164	N82°31'53"W	367.47'
W8-2-165	N77°03'21"W	547.35'
W8-2-166	N55°59'38"W	497.56'
W8-2-167	N38°24'24"E	357.53'
W8-2-168	S55°32'51"E	192.31'
W8-2-169	S48°45'00"E	210.92'
W8-2-170	S79°02'43"E	302.06'
W8-2-171	N76°52'30"E	106.89'
W8-2-172	N64°25'48"E	246.52'
W8-2-173	S66°50'40"E	426.94'
W8-2-174	N87°19'14"E	122.14'
W8-2-175	N76°35'34"E	500.39'
W8-2-176	S37°25'07"E	247.68'
W8-2-177	S68°08'25"E	251.20'
W8-2-178	S77°33'56"E	193.14'
W8-2-179	S48°02'59"E	1307.30'
W8-2-180	S44°46'35"E	328.50'
W8-2-181	S66°56'37"E	359.04'
W8-2-182	S82°38'56"E	1033.58'
W8-2-183	N84°15'23"E	231.12'
W8-2-184	N52°20'01"E	183.19'
W8-2-185	N85°14'06"E	279.12'
W8-2-186	S66°02'11"E	2114.68'
W8-2-187	S24°00'10"E	493.72'
W8-2-188	S42°05'27"E	113.00'
W8-2-189	S60°40'28"E	783.43'
W8-2-190	S45°41'59"E	302.49'
W8-2-191	S66°51'29"E	205.89'
W8-2-192	S39°49'00"E	271.46'
W8-2-193	S69°00'27"E	189.91'
W8-2-194	S30°18'09"E	229.02'
W8-2-195	S44°53'37"E	165.30'
W8-2-196	S75°17'13"E	178.68'
W8-2-197	S16°17'14"E	225.19'
W8-2-198	S50°18'00"E	229.26'
W8-2-199	S22°45'06"E	2992.05'
W8-2-200	S49°33'55"W	634.67'
W8-2-201	S65°58'57"W	752.51'
W8-2-202	S22°33'26"W	407.27'
W8-2-203	S16°26'35"W	539.17'
W8-2-204	S24°36'45"W	496.23'
W8-2-205	S09°42'38"W	396.88'
W8-2-206	S08°59'21"W	1215.95'
W8-2-207	S09°39'34"W	327.16'
W8-2-208	S32°13'55"W	192.41'
W8-2-209	S51°54'31"W	222.81'
W8-2-210	S22°17'29"W	152.97'
W8-2-211	S06°15'57"E	527.46'
W8-2-212	S09°16'34"E	482.02'
W8-2-213	S25°10'02"E	1072.51'
W8-2-214	S69°07'12"E	256.43'
W8-2-215	N78°07'19"E	145.82'
W8-2-216	N58°51'59"E	245.59'
W8-2-217	N70°19'08"E	1369.31'
W8-2-218	N89°13'06"E	734.89'
W8-2-219	N73°18'17"E	384.48'
W8-2 220	S89°24'46"E	592.83'
W8-2-221	N50°10'44"E	276.68'

W8-2 LINE TABLE		
LINE	BEARING	DISTANCE
W8-2-222	S74°13'33"E	1156.06'
W8-2-223	S54°28'09"E	567.34'
W8-2-224	S47°52'49"E	614.27'
W8-2-225	S86°30'53"E	581.12'
W8-2-226	N72°35'45"E	692.34'
W8-2-227	S18°05'43"E	321.68'
W8-2-228	S16°07'20"E	1698.42'
W8-2-229	S38°00'40"W	287.68'
W8-2-230	S08°02'38"W	489.59'
W8-2-231	S20°45'46"E	271.44
W8-2-232	S32°23'44"E	227.04'
W8-2-233	S62°14'09"E	450.38'
W8-2-234	S63°11'19"E	353.56'
W8-2-235	S66°14'00"E	17.67'
W8-2-236	S22°43'20"W	27.32'
W8-2-237	S17°46'37"W	24.20'
W8-2-238	S01°52'27"W	49.27'
W8-2-239	S57°29'35"E	907.02'
W8-2-240	S59°45'27"E	340.93'
W8-2-241	S49°04'58"E	120.10'
W8-2-242	S61°14'53"W	229.47'
W8-2-243	S39°44'23"W	184.56'
W8-2-244	S20°54'31"W	132.34'
W8-2-245	S87°22'39"W	76.54'
W8-2-246	S76°50'28"W	59.31'
W8-2-247	S72°56'15"W	222.68'
W8-2-248	S66°49'01"W	109.94'
W8-2-249	S32°34'13"W	330.48'
W8-2-250	S12°59'41"W	208.46'
W8-2-251	S17°44'41"E	273.43'
W8-2-252	S24°14'59"E	254.15'
W8-2-253	N88°26'09"W	68.20'
W8-2-254	N81°02'09"W	18.46
W8-2-255	N40°11'12"W	31.43
W8-2-256	N26°49'42"W	363.82
W8-2-257	N11°16'20"E	16.11
W8-2-258	N67°18'52"W	237.75'
W8-2-259	N53°15'52"W	42.87'
W8-2-260	N63°00'35"W	106.43'
W8-2-261	N26°59'25"E	140.05'
W8-2-262	N88°16'12"W	1407.24'
W8-2-263	S08°11'13"W	37.23'
W8-2-264	S76°43'08"E	241.04'
W8-2-265	S66°12'49"E	241.99'
W8-2-266	S61°06'07"E	205.19'
W8-2-267	S16°03'28"E	29.42'
W8-2-268	S30°22'45"W	18.58'
W8-2-269	N59°37'17"W	63.56'
W8-2-270	S24°31'09"W	126.00'
W8-2-271	S42°42'58"W	435.59'
W8-2-272	S57°12'08"W	74.35
W8-2-273	S46°08'11"E	67.13'
W8-2-274	S02°21'57"W	699.86'
W8-2-275	S37°25'13"W	257.53
W8-2-276	S15°18'44"W	196.06'
W8-2-277	S24°46'38"W	113.24'
W8-2-278	S42°30'49"W	85.84'
W8-2-279	S16°38'13"W	213.43'
W8 2 280	S06°06'27"W	95.79'

Book
938
Pgs
23-23

RECORD OF SURVEY

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

SHEET 21 OF 21

#23.

SURVEYOR'S STATEMENT

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE PROFESSIONAL LAND SURVEYORS ACT AT THE REQUEST OF SANTA CLARA VALLEY WATER DISTRICT IN ___________, 20___.

FRANK A. BORGES, PLS
PLS NO. 7922

COUNTY SURVEYOR'S STATEMENT

THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE PROFESSIONAL LAND SURVEYOR'S ACT THIS ____ DAY OF _______________, 2020.

AUGUST HANKS, COUNTY SURVEYOR
PLS NO. 9274

JEREMY KOENIG, DEPUTY COUNTY SURVEYOR
PLS NO. 9394

RECORDER'S STATEMENT

FILED THIS _________ DAY OF _______________, 2020, AT ________, IN BOOK ___________ OF MAPS AT PAGE(S) __________, AT THE REQUEST OF TOWILL, INC.

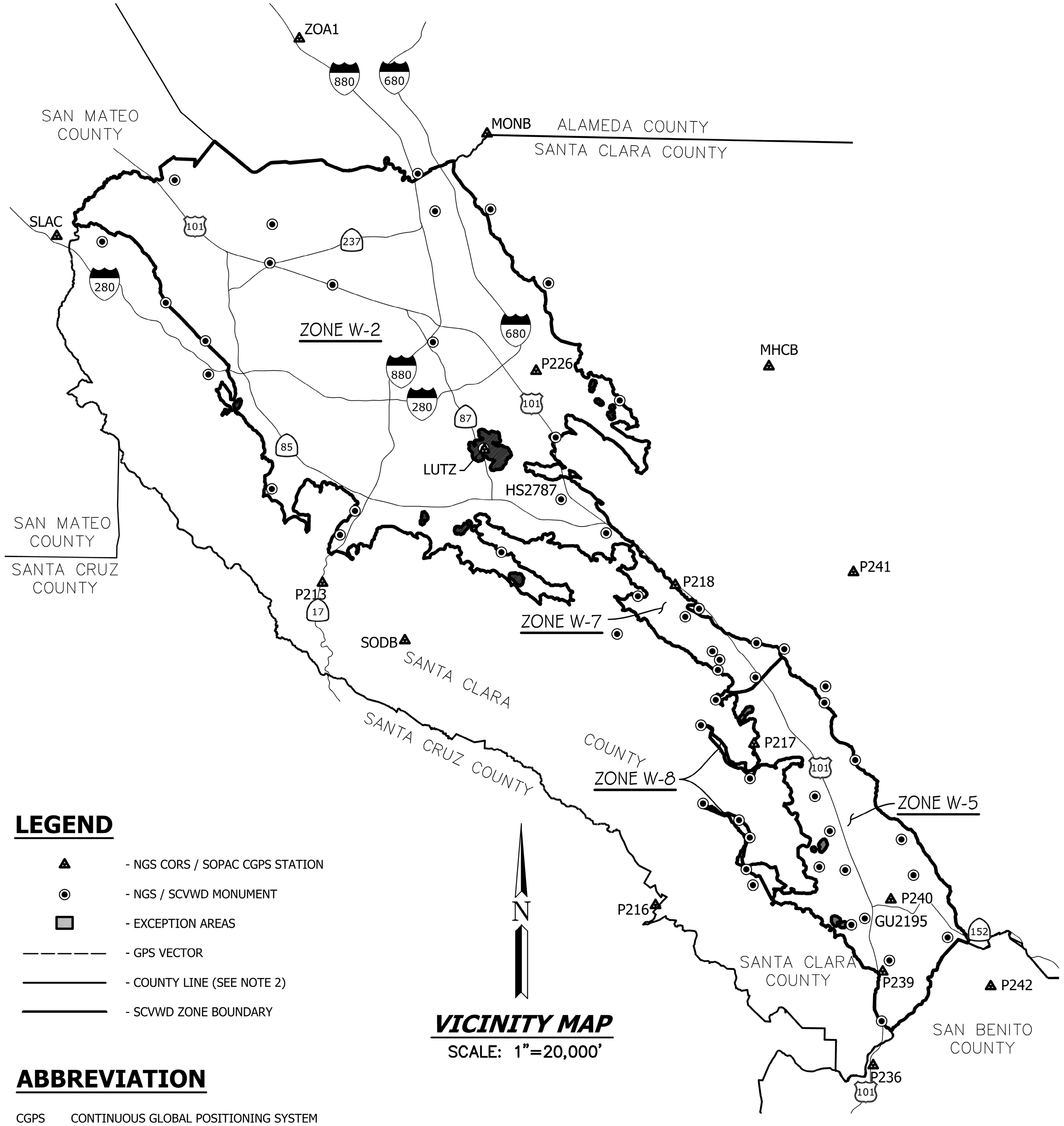
REGINA ALCOMENDRAS
SANTA CLARA COUNTY RECORDER

BY: ______________________________
DEPUTY COUNTY RECORDER

FILE NO.:_______________ FEE:_________

SURVEYOR'S NOTES

1. THIS SURVEY DOES NOT ESTABLISH OR REPRESENT ANY BOUNDARY LINES, COUNTY BOUNDARY LINES OR ANY OTHER REAL PROPERTY LINES.
2. THE COUNTY BOUNDARY LINES SHOWN ARE APPROXIMATE AND WERE DERIVED FROM BEST DIGITAL DATA AVAILABLE AT THE TIME OF THIS SURVEY.



VICINITY MAP
SCALE: 1"=20,000'

LEGEND

▲	- NGS CORS / SOPAC CGPS STATION
◉	- NGS / SCVWD MONUMENT
▨	- EXCEPTION AREAS
– – – – –	- GPS VECTOR
———	- COUNTY LINE (SEE NOTE 2)
━━━	- SCVWD ZONE BOUNDARY

ABBREVIATION

CGPS	CONTINUOUS GLOBAL POSITIONING SYSTEM
CORS	CONTINUOUSLY OPERATING REFERENCE STATION
NGS	NATIONAL GEODETIC SURVEY
SCVWD	SANTA CLARA VALLEY WATER DISTRICT
SOPAC	SCRIPPS ORBIT AND PERMANENT ARRAY CENTER

SHEET INDEX

1. COVER SHEET – VICINITY MAP
2. GPS NETWORK ADJUSTMENT REPORT
3. NGS / SCVWD MONUMENT TABLE
4. ZONE W-2 OVERVIEW
5. ZONE W-2 DETAIL 2A-2Z
6. ZONE W-2 EXCEPTION AREA 1-2
7. ZONE W-2 EXCEPTION AREA 3-8
8. ZONE W-2 EXCEPTION AREA 9
9. ZONE W-2 LINE TABLE (1-584)
10. ZONE W-2 LINE TABLE (585-1168)
11. ZONE W-2 LINE TABLE (1169-1752)
12. ZONE W-2 LINE TABLE (1153-2251)
13. ZONE W-5 OVERVIEW, DETAIL 5A-5Q
14. ZONE W-5 DETAIL 5R,5S & EXCEPTION AREA 1-5
15. ZONE W-5 LINE TABLE (1-576)
16. ZONE W-5 LINE TABLE (577-1152)
17. ZONE W-5 LINE TABLE (1153-1279)
18. ZONE W-7 OVERVIEW, DETAIL 7A-7L
19. ZONE W-7 LINE TABLE (1-343)
20. ZONE W-8 OVERVIEW, DETAIL 8A-8G
21. ZONE W-8 LINE TABLE (1-280)

STATEMENT OF PURPOSE

THE PURPOSE OF THIS SURVEY IS TO ESTABLISH HORIZONTAL CONTROL POINTS THROUGHOUT THE GROUNDWATER BENEFIT ZONES OF SANTA CLARA VALLEY WATER DISTRICT (SCVWD), IN THE COUNTY OF SANTA CLARA, USING EXISTING NGS & SCVWD MONUMENTS CONSTRAINING TO CORS/CGPS STATIONS BASED ON THE NORTH AMERICAN DATUM OF 1983 (CSRC) 2017.50 EPOCH.

BASIS OF BEARINGS

BEARINGS, COORDINATES, AND DISTANCES SHOWN HEREON ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM OF 1983, ZONE III, NORTH AMERICAN DATUM OF 1983 (CSRC) EPOCH 2017.50. DISTANCES SHOWN HEREON, ARE GRID DISTANCES UNLESS OTHERWISE NOTED.

ZONES W-2 & W-7:

GROUND DISTANCES MAY BE OBTAINED BY MULTIPLYING BY A COMBINATION FACTOR OF 1.000037821 CALCULATED AT NGS MONUMENT "QQ 453" (PID HS2787).

ZONES W-5 & W-8:

GROUND DISTANCES MAY BE OBTAINED BY MULTIPLYING BY A COMBINATION FACTOR OF 0.99998858 CALCULATED AT NGS MONUMENT "C 1193" (PID GU2195).

RECORD OF SURVEY NO. ____

****
OF THE SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONES W-2, W-5, W-7, W-8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA
****
SCALE: 1"=20,000' FEBRUARY, 2020

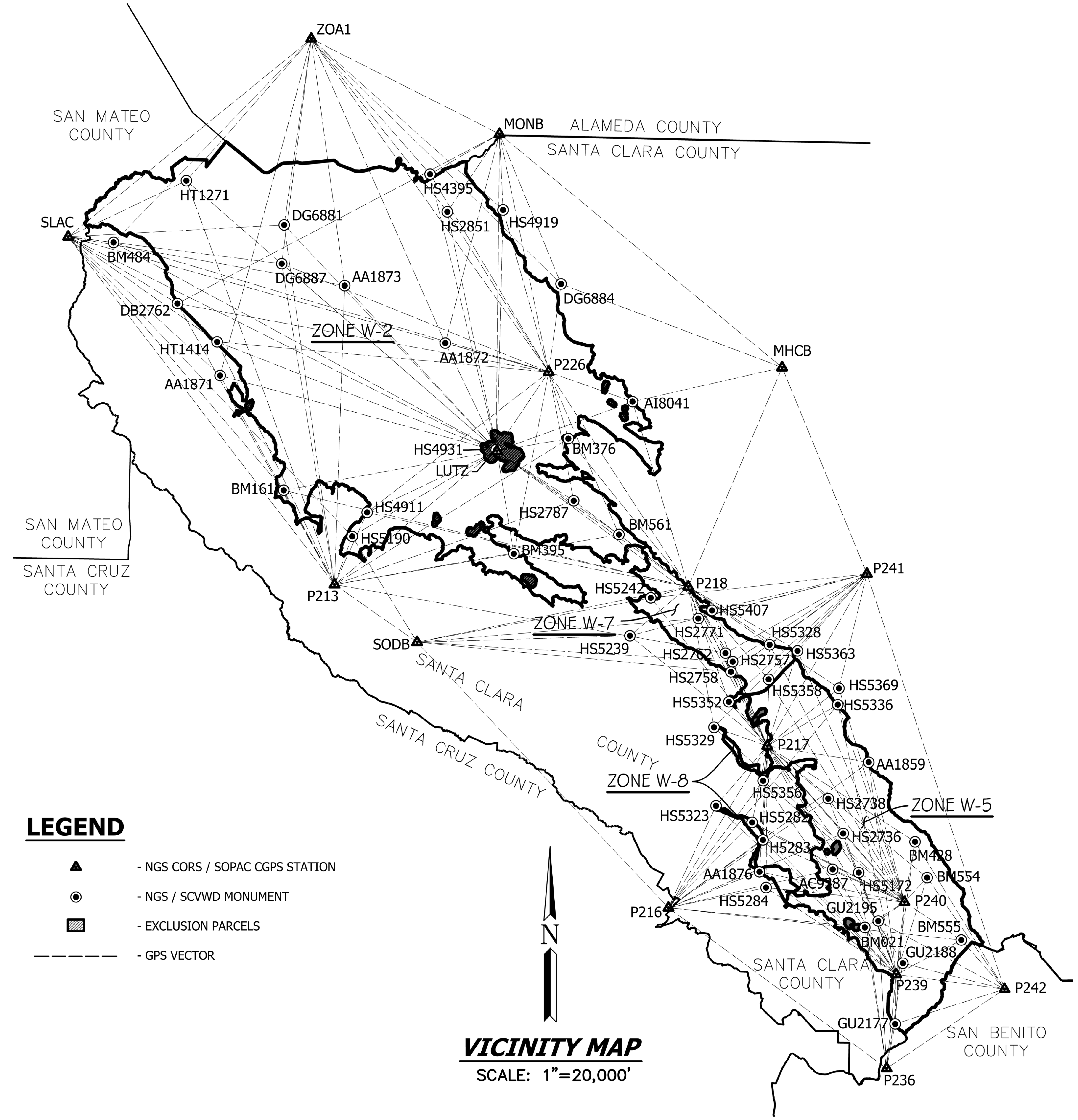
BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 1 OF 21

NETWORK ADJUSTMENT OVERVIEW

THE NETWORK ADJUSTMENT OF THIS SURVEY PROVIDES THE FRAMEWORK FOR SUPPORTING THE GENERAL ACTIVITIES OF THE SANTA CLARA VALLEY WATER DISTRICT GROUNDWATER BENEFIT ZONES. THIS NETWORK ADJUSTMENT CONSIST OF A TOTAL OF 16 CGPS (CORS & SOPAC STATIONS) AND 54 PASSIVE MONUMENTS, FROM BOTH THE NGS AND SCVWD.



LEGEND

- ▲ - NGS CORS / SOPAC CGPS STATION
- ◉ - NGS / SCVWD MONUMENT
- ▨ - EXCLUSION PARCELS
- — — — — - GPS VECTOR

VICINITY MAP

SCALE: 1"=20,000'

RECORD OF SURVEY NO. ____

OF THE SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONES W-2, W-5, W-7, W-8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: 1"=20,000' FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

NGS / SCVWD MONUMENTS				
Point ID	Northing	Easting	COH 88 Elevation	Description
AA1859	1858857.98	6249254.35	385.34	"HPGN D CA NEW" 2-inch alum. disc, stamped "NEW HPGN-D 1992"
AA1871	1947026.36	6101391.70	435.30	"HPGN D CA SAN ANTONIO" 2.5-inch alum. disc, stamped "HPGN D SAN ANTONIO 1992"
AA1872	1954404.58	6152723.93	60.49	"HPGN D CA SAN PEDRO" 2.5-inch alum. disc, stamped "HPGN D SAN PEDRO 1992"
AA1873	1967518.60	6129780.90	25.98	"HPGN D CA MISSION" 2.5-inch alum. disc, stamped "COUNTY OF SANTA CLARA HPGN D MISSION 1992"
AA1876	1833888.53	6224355.71	299.21	"HPGN D CA ADAMS RESET" 2.5-inch alum. disc, stamped "HPGN D ADAMS RESET 1992"
AC9287	1834452.17	6241030.77	222.28	"G 812 RESET" 3.5-inch alum. disc, stamped "G 815 RESET 1993"
AI8041	1941052.84	6195424.92	487.34	"T 1474" steel rod in mon. well; no mark surveyed at center of rod
BM021	1821222.90	6248358.53	222.69	"SCVWD BM021" 2-inch brass disc, stamped "SCVWD BM 021"
BM161	1920877.22	6115896.55	455.25	"SCVWD BM161" 2-inch brass disc, stamped "SCVWD BM 161"
BM376	1932624.74	6180788.35	164.65	"SCVWD BM376" 2-inch brass disc; stamped "SCVWD BM376"
BM395	1906387.23	6168363.64	256.47	"SCVWD BM395" 2-inch brass disc, not stamped
BM428	1840731.27	6259815.14	310.91	"SCVWD BM0428" 2-inch alum. disc; stamped "SANTA CLARA VALLEY WATER DISTRICT BENCHMARK"
BM484	1977344.94	6077103.10	200.84	"SCVWD BM484" 2-inch brass disc, stamped "SANTA CLARA VALLEY WATER DISTRICT BENCHMARK 484 2006"
BM554	1832563.99	6262569.66	207.86	"SCVWD BM554" 2-inch brass disc, stamped "SANTA CLARA VALLEY WATER DISTRICT BENCHMARK 554 2008"
BM555	1818353.83	6270357.71	148.05	"SCVWD BM555" 2-inch brass disc; stamped 'US DEPARTMENT OF THE INTERIOR BM"
BM561	1910782.03	6192316.66	222.32	"SCVWD BM561" 2-inch brass disc; stamped "SCVWD BM561 RESET 2001"
DB2762	1963426.68	6091663.02	208.91	"ALTOS RESET RM 3" 3-inch brass disc; stamped "ALTOS 1957 NO. 3 1972"
DG6881	1981336.48	6115993.03	4.24	"ARC 34" 3.5-inch brass disc; stamped "ARC 34"
DG6884	1967896.29	6179117.18	548.51	"CROTHERS" 2-inch brass disc; stamped "COUNTY OF SANTA CLARA ROAD COMM"
DG6887	1972516.68	6115439.35	36.02	"LOCKHEED" 3-inch brass disc; stamped "SCVWD BM 483 LOCKHEED"
GU2177	1799234.95	6255276.66	147.07	"S 149" 3-inch brass disc; stamped "US COAST & GEODETIC SURVEY BENCHMARK S149 1933"
GU2188	1813060.68	6257039.28	179.72	"R 149" 2-inch brass disc; stamped "US COAST & GEODETIC SURVEY BENCHMARK R149 1933"
GU2195	1822679.97	6251434.42	190.92	"C 1193" 3-inch alum disc; stamped "US COAST & GEODETIC SURVEY BENCHMARK C1193 1968"
HS2736	1842628.42	6243436.35	236.43	"M 149" 2.5-inch brass disc; stamped "US COAST & GEODETIC SURVEY BENCHMARK M149 1933"
HS2738	1850570.69	6240040.24	266.79	"G 1080" 3-inch brass disc; stamped "US COAST & GEODETIC SURVEY BENCHMARK G1080 1967"
HS2757	1881802.89	6218243.41	340.25	"A 177" 3.5-inch alum disc; stamped "US COAST & GEODETIC SURVEY BENCHMARK A177 1934"
HS2758	1879455.71	6217851.74	348.39	A 1077 X 2.5-inch alum disc; stamped "US COAST & GEODETIC SURVEY BENCHMARK A1077X 1967"
HS2762	1883761.23	6216603.90	335.57	"J 453" 2.5-inch brass disc; stamped "US COAST & GEODETIC SURVEY BENCHMARK J453 1954"
HS2771	1891660.46	6210401.44	303.03	"PERRYS RM 4" 2.5-inch brass disc' stamped "US COAST & GEODETIC SURVEY PERRYS NO. 4 1946"
HS2787	1918486.92	6182012.53	190.66	"QQ 453" 3-inch brass disc; stamped "US COAST & GEODETIC SURVEY QQ453 1954"
HS2851	1984338.44	6153197.57	15.77	"M 874" 3.5-inch brass disc; stamped "US COAST & GEODETIC SURVEY M874 1954"
HS4395	1992944.45	6149256.92	16.10	"C 1371" 3.5-inch alum disc; stamped "NATIONAL GEODETIC SURVEY VERTICAL CONTROL MARK C1371 1983"
HS4911	1915822.69	6134903.61	307.52	"VASONA" 2.5-inch brass disc; stamped "VASONA 1972"
HS4919	1984757.82	6165893.94	584.14	"COCHES" 3.5-inch alum disc; stamped "US COAST & GEODETIC SURVEY TRIANGULATION STATION COCHES 1958"
HS4931	1930119.03	6164312.71	437.17	"AMERICAN RESET" 2-inch brass disc; stamped "AMERICAN 1947 1973"
HS5172	1833730.55	6246961.77	208.78	"Q 1448" steel rod in mon. well
HS5190	1910355.23	6131486.67	370.32	"J 1456" steel rod in mon. well
HS5239	1887693.87	6194817.56	515.54	"HJH 51" 4-inch brass disc; stamped "US GEOLOGICAL SURVEY BENCHMARK HJH 51 1948"
HS5242	1896341.00	6199576.30	254.92	"X 1457" steel rod in mon. well
HS5282	1845160.57	6222675.21	385.84	"T 1458" steel rod in mon. well
HS5283	1841145.25	6225144.31	337.92	"110 JD" 4-inch brass disc; stamped "NATIONAL GEODETIC SURVEY VERTICAL CONTROL MARK 110JD 2001"
HS5284	1830297.86	6225858.93	325.17	"U 1458" steel rod in mon. well
HS5323	1848959.50	6214444.82	503.28	"C 030" 2.5-inch brass disc; stamped "SANTA CLARA VALLEY WATER DISTRICT"
HS5328	1885648.65	6226669.00	388.48	"M 099" 1-inch iron pipe w/ yellow plug
HS5329	1866847.20	6213989.78	462.39	"M 103" 3/4-inch iron pipe open
HS5336	1871995.37	6242206.89	443.84	"M 174" 3/4-inch iron pipe open
HS5352	1872650.93	6217366.81	416.59	"M 351" 2-inch brass disc; not stamped, located center of disc
HS5356	1854669.64	6225179.04	373.76	"M 355" 3/4-inch iron pipe w/ yellow plug
HS5358	1877756.27	6226429.27	370.99	"M 357" railroad spike
HS5363	1884274.45	6233024.82	647.27	"M 362" railroad spike
HS5369	1875725.20	6242469.61	879.48	"M 368" 2-inch brass disc; not stamped, located center of disc
HS5407	1893492.29	6213542.84	338.31	"HPGN CA 04 03" 2.5-inch alum disc; stamped "CALIF DEPT OF TRANSPORTATION HPGN STA 04-03 1990"
HT1271	1991436.02	6093693.81	7.31	"941 4537 TIDAL 4 RESET" 3.5-inch bass disc
HT1414	1954694.30	6100718.56	237.50	"J 884" 2-inch brass disc; ; stamped "US GEOLOGICAL SURVEY BENCHMARK"

PROJECT COORDINATES REPORT:

DATE OF SURVEY:	DECEMBER 19, 2019 – JANUARY 21, 2020
HORIZONTAL DATUM:	NORTH AMERICAN DATUM 1983 (CSRC), EPOCH 2017.50
VERTICAL DATUM:	CALIFORNIA ORTHOMETRIC HEIGHT 1988 (COH88)
COORDINATE SYSTEM:	CALIFORNIA COORDINATE SYSTEM ZONE 3

NOTES:

1. SEE SHEET 1 FOR STATEMENT OF PURPOSE, SHEET INDEX.
2. SEE SHEET 2 FOR VICINITY MAP.

CGPS / CORS CONTROL STATIONS				
Point ID	Latitude	Longitude	Ellipsoidal Height	Description (Site Name)
LUTZ	***37-17-12.659850***	***121-51-54.768430***	***313.31***	SOPAC LUTZ
MHCB*	***37-20-29.50724***	***121-38-33.23271***	***4141.44***	CORS MT HAMILTON BARD
MONB	***37-29-07.165643***	***121-52-00.668458***	2463.50	SOPAC MONUMENT PEAK
P213	***37-12-06.159819***	***121-59-26.966052***	***549.96***	SOPAC LENIHANDAM CN2005
P216	37-00-08.727223	121-43-34.301152	1107.15	SOPAC MTMADONNA CN2007
P217	***37-06-16.182827***	***121-39-02.230374***	***238.98***	CORS LACROSSEDR CN2005
P218	***37-12-12.645222***	***121-42-50.210313***	***273.09***	SOPAC COYOTECRK CN2005
P226	***37-20-12.385669***	***121-49-32.061069***	***18.34***	SOPAC REIDHILLVW CN2006
P236	***36-54-12.755154***	***121-33-16.012635***	***186.04***	SOPAC LOMERIAS CN2005
P239	***36-57-44.856268***	***121-32-51.986749***	***62.51***	SOPAC UVASCRK CN2008
P240	***37-00-28.097252***	***121-32-31.272883***	***86.24***	SOPAC MILLERSLGH CN2005
P241*	***37-12-46.82867***	***121-34-27.28534***	***2738.75***	SOPAC RODEOFLAT CN2007
P242	***36-57-14.147085***	***121-27-47.412947***	***50.15***	SOPAC FRAZIERAIR CN2004
SLAC	***37-24-59.457424***	***122-12-15.302399***	***210.66***	CORS SLAC BARD CN2002
SODB	***37-09-59.052335***	***121-55-31.825104***	***3235.15***	SOPAC SODA SPRINGS-BARD STATION
ZOA1	***37-32-34.985867***	***122-00-57.358294***	***-11.24***	CORS OAKLAND 1
Items that are BOLD were constraining elements in the final adjustment				
* TRANSFORMED POSITIONS BETWEEN EPOCH 2019.93 TO 2017.50 (NGS HTDP SITE)				

RECORD OF SURVEY NO. ____

* * *

OF THE SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONES W-2, W-5, W-7, W-8

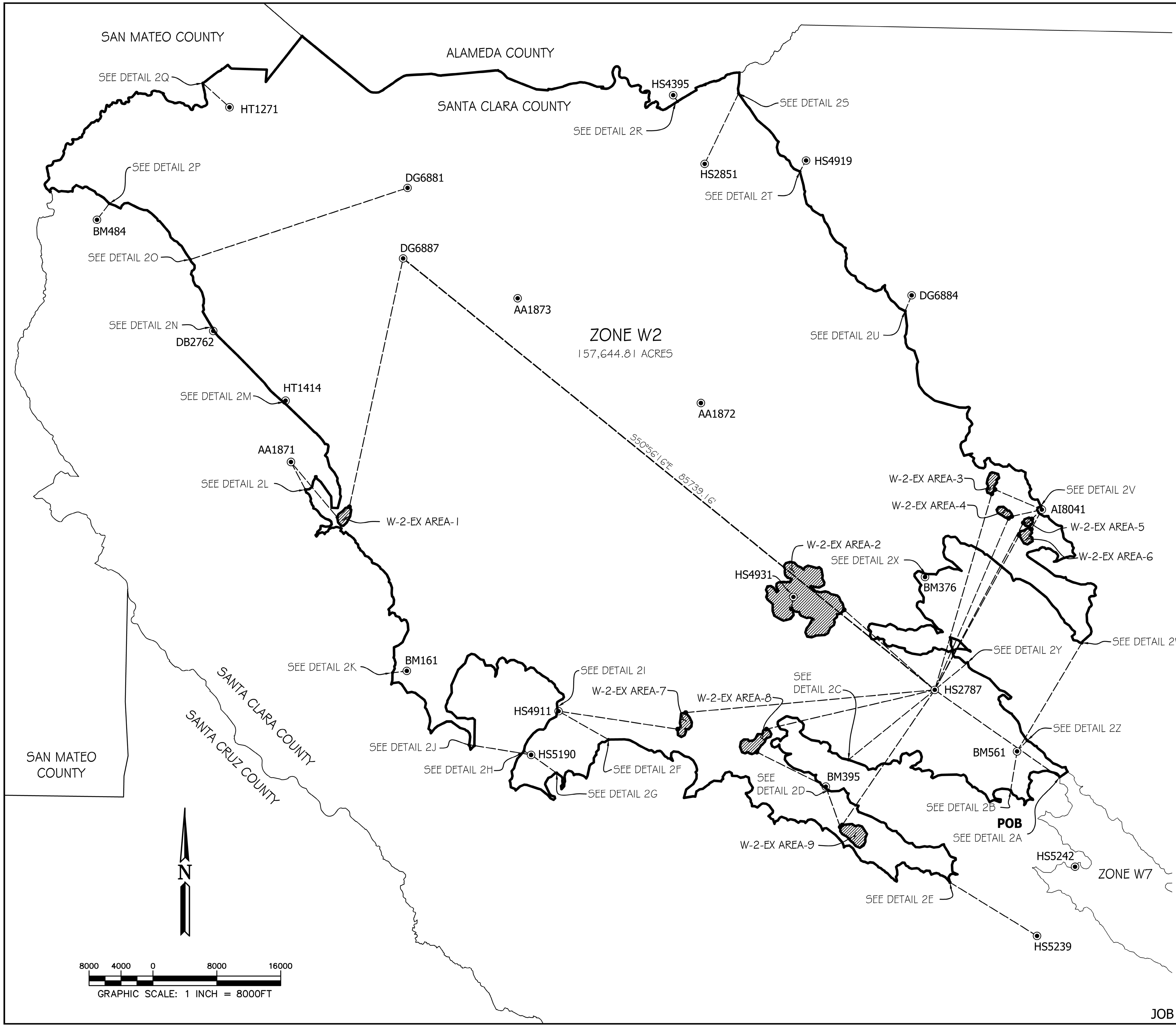
LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

* * *

SCALE: NO SCALE FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310



NOTE

1. LINE TABLE SHOWN ON SHEETS 9-12 REPRESENTS THE COURSES OF ZONE W-2 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN HERE.
2. SEE SHEETS 5-8 FOR DETAILS 2A-2U AND W-2-EXCEPTION AREAS 1-9.

LEGEND

◉ - NGS / SCVWD MONUMENT

— — — - GPS VECTOR (GRID TIE)

━━━ - SCVWD ZONE W-2

▨ - EXCEPTION AREAS

RECORD OF SURVEY NO. ____

* * *

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

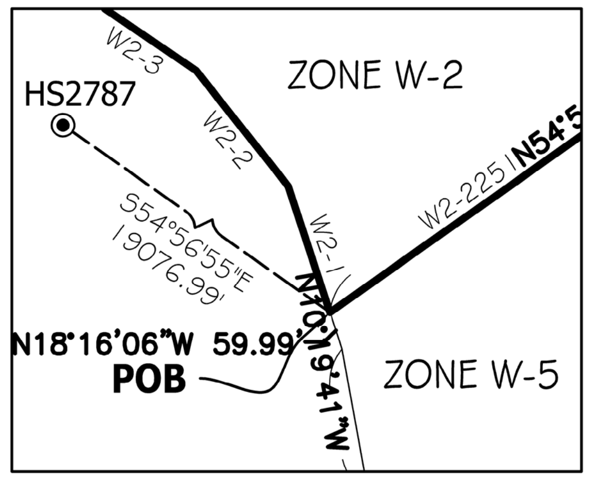
* * *

SCALE: 1"=8000' FEBRUARY, 2020

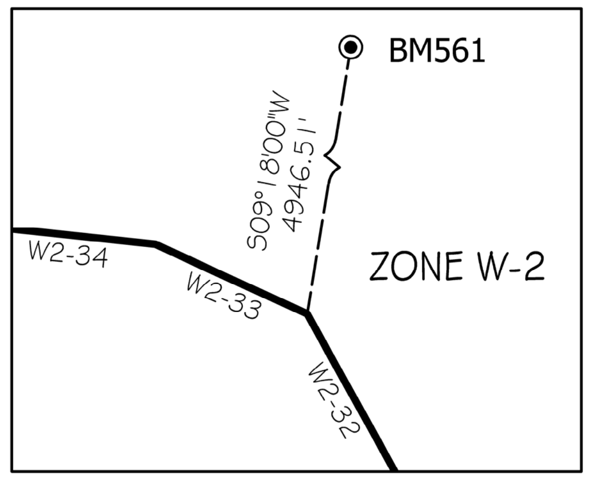
BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

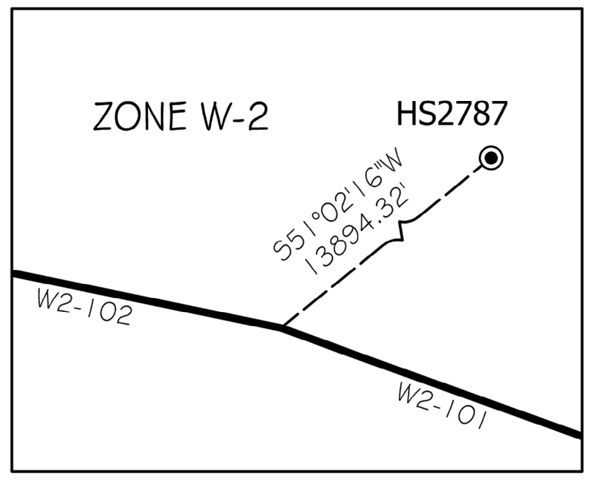
SHEET 4 OF 21



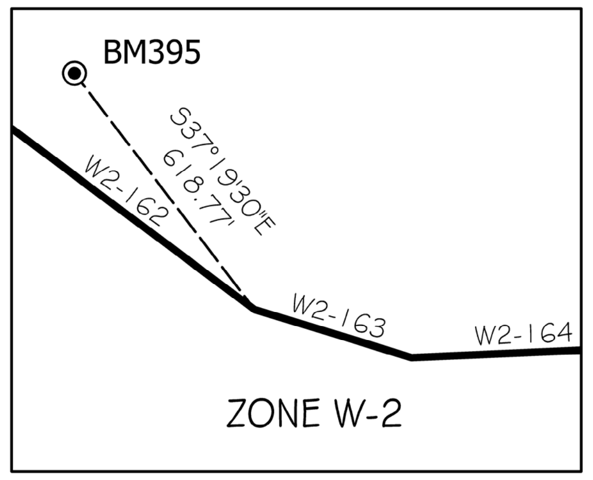
DETAIL 2A
N.T.S.



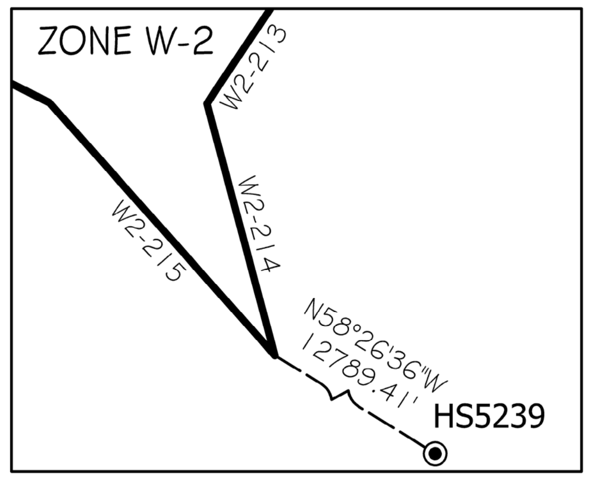
DETAIL 2B
N.T.S.



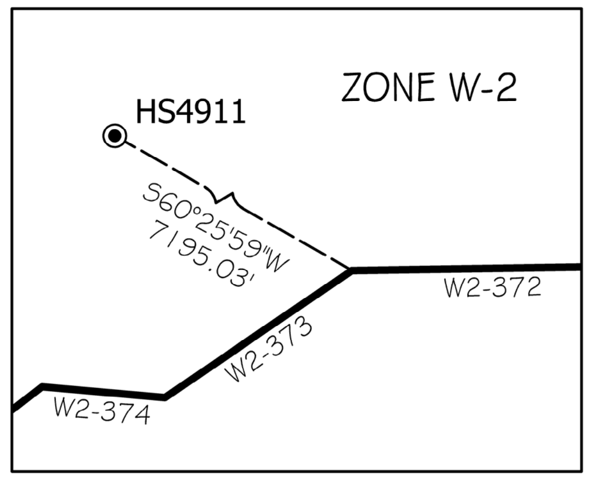
DETAIL 2C
N.T.S.



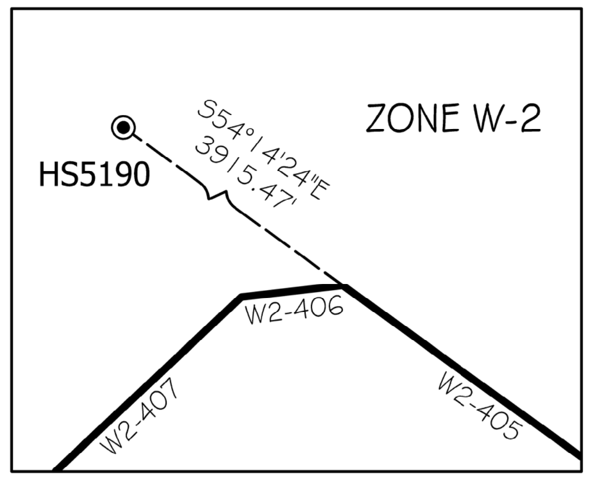
DETAIL 2D
N.T.S.



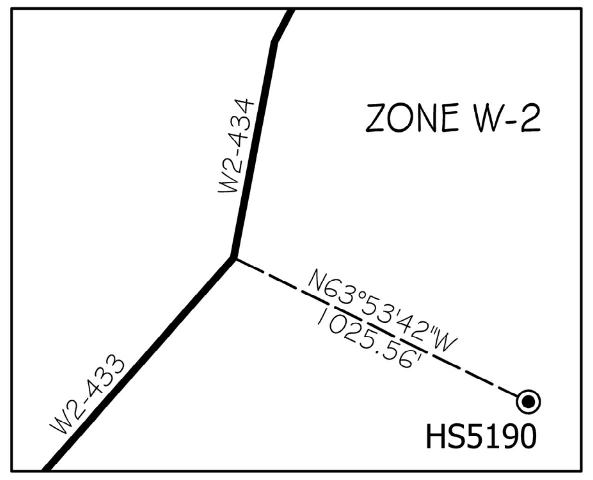
DETAIL 2E
N.T.S.



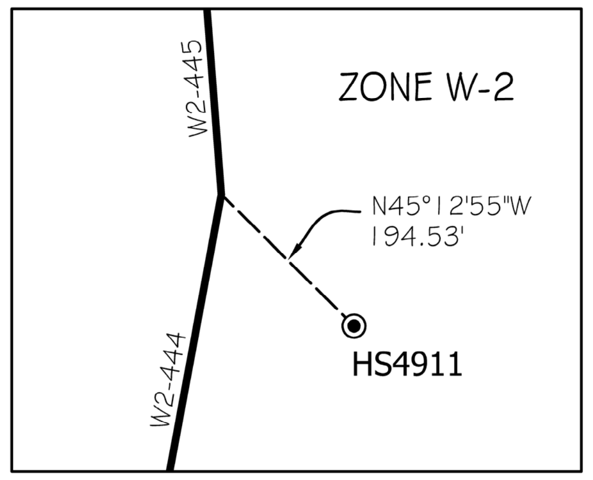
DETAIL 2F
N.T.S.



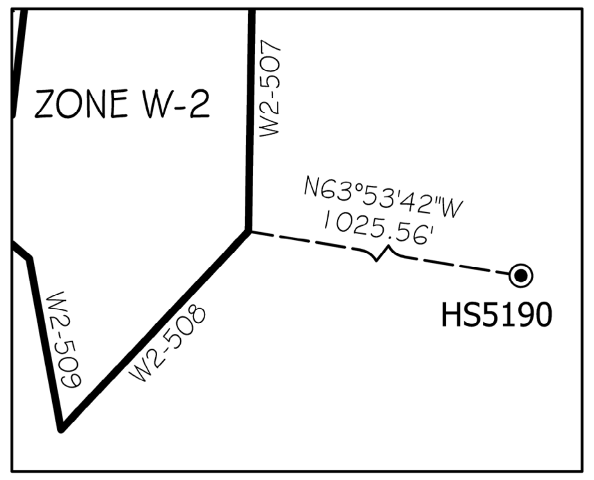
DETAIL 2G
N.T.S.



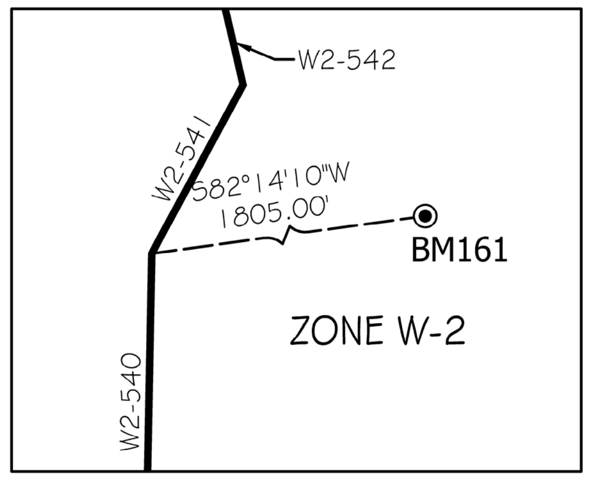
DETAIL 2H
N.T.S.



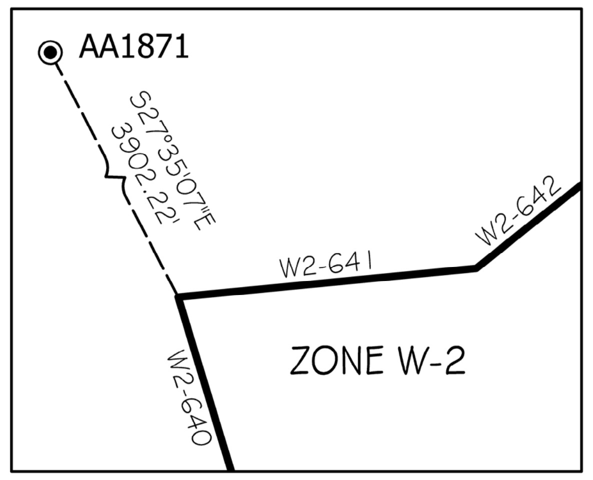
DETAIL 2I
N.T.S.



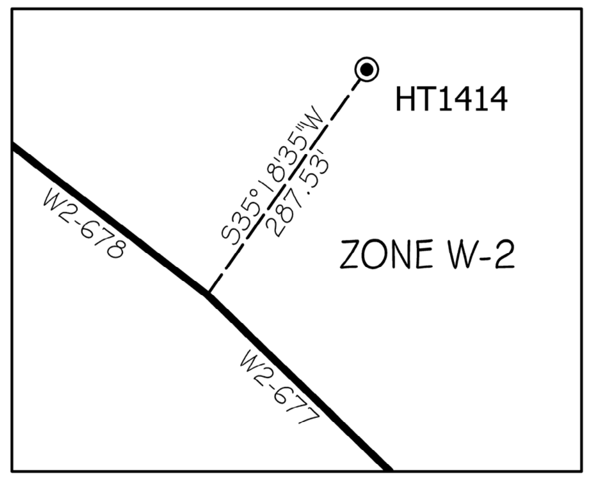
DETAIL 2J
N.T.S.



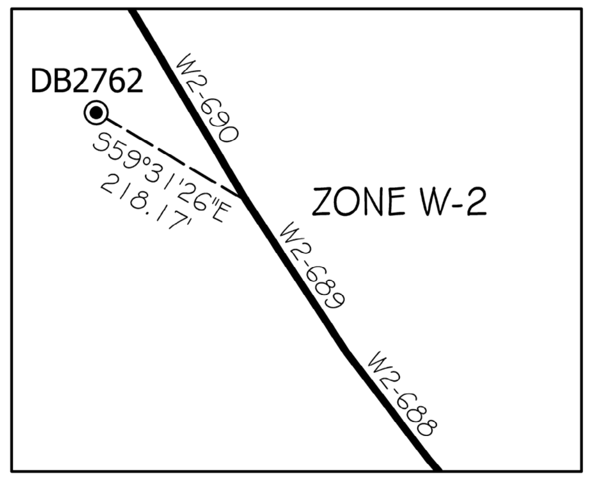
DETAIL 2K
N.T.S.



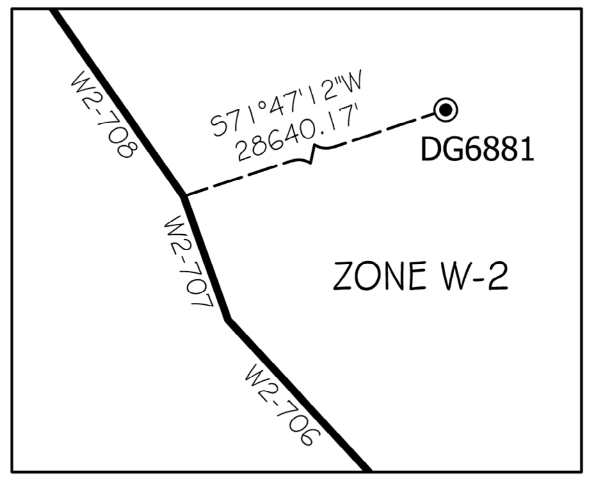
DETAIL 2L
N.T.S.



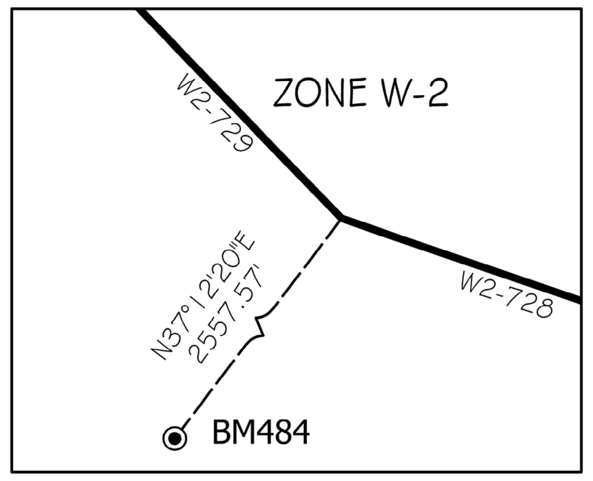
DETAIL 2M
N.T.S.



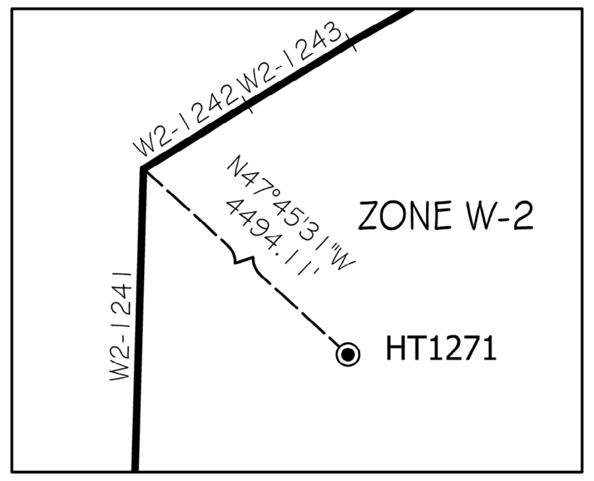
DETAIL 2N
N.T.S.



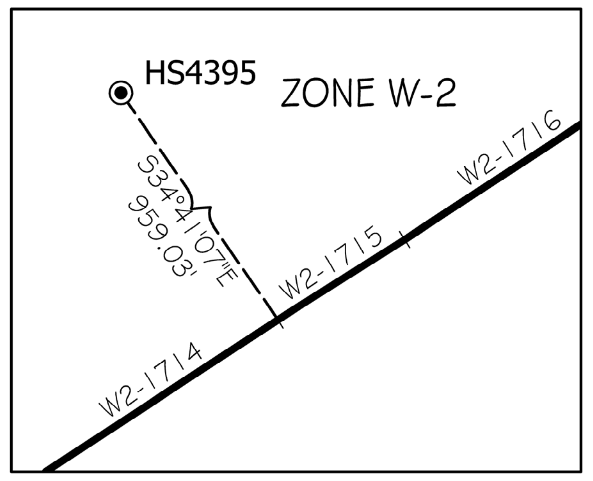
DETAIL 2O
N.T.S.



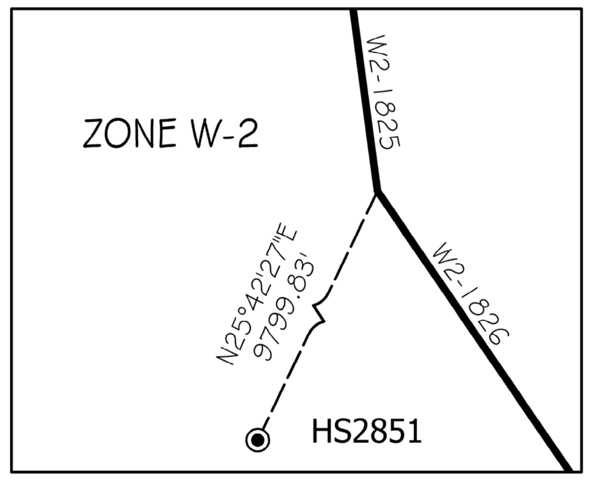
DETAIL 2P
N.T.S.



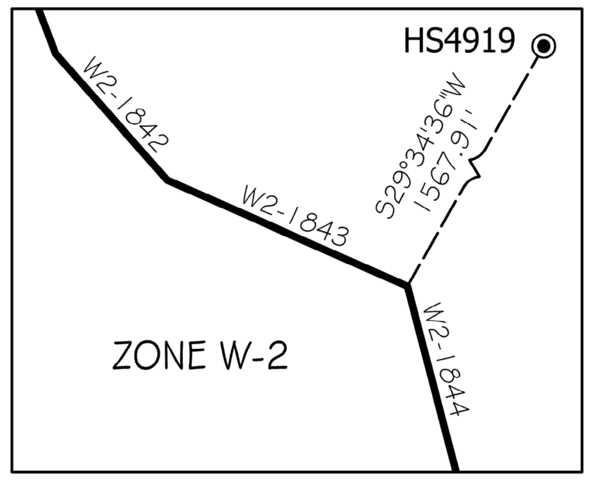
DETAIL 2Q
N.T.S.



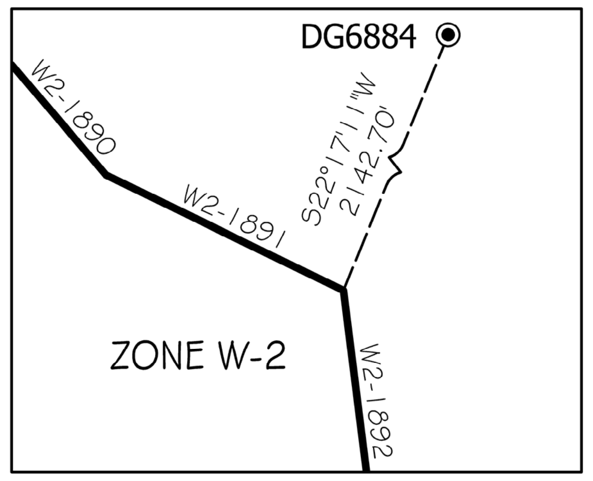
DETAIL 2R
N.T.S.



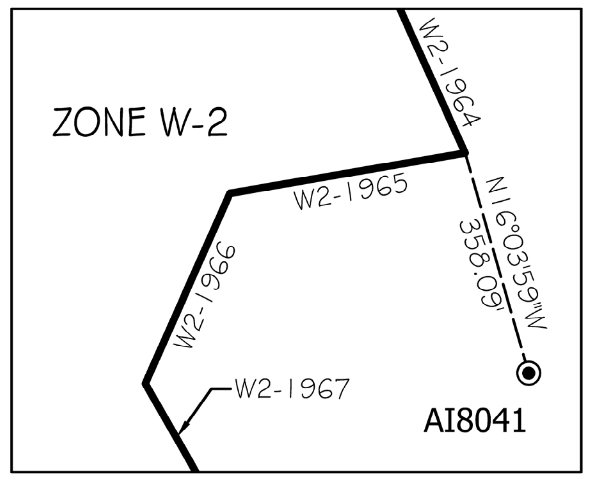
DETAIL 2S
N.T.S.



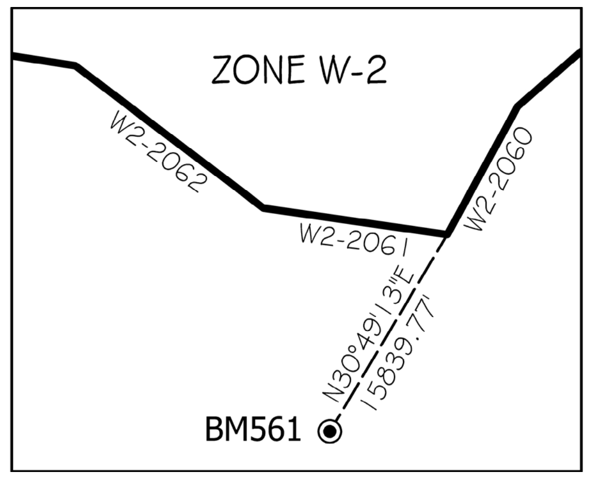
DETAIL 2T
N.T.S.



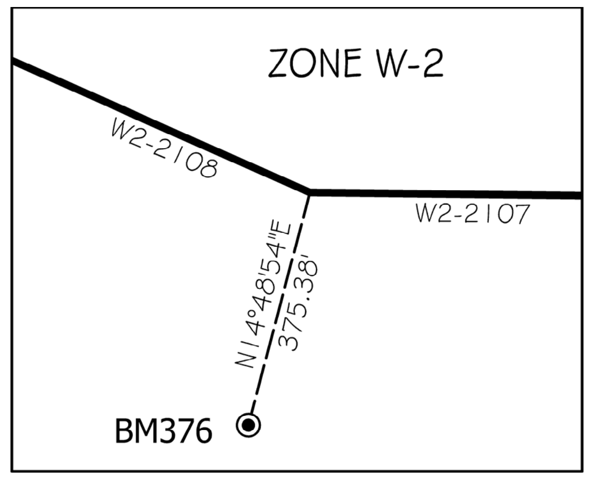
DETAIL 2U
N.T.S.



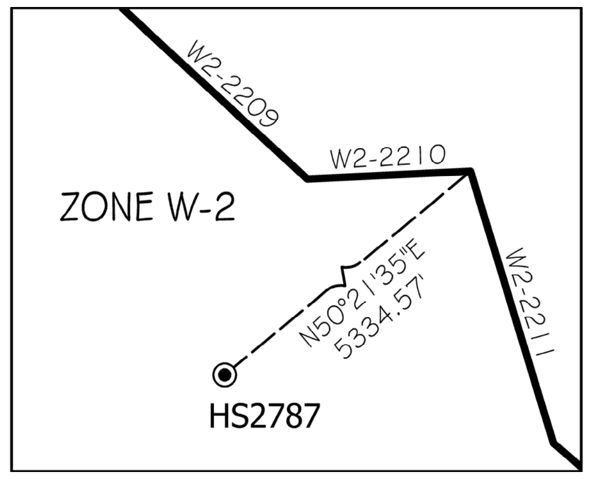
DETAIL 2V
N.T.S.



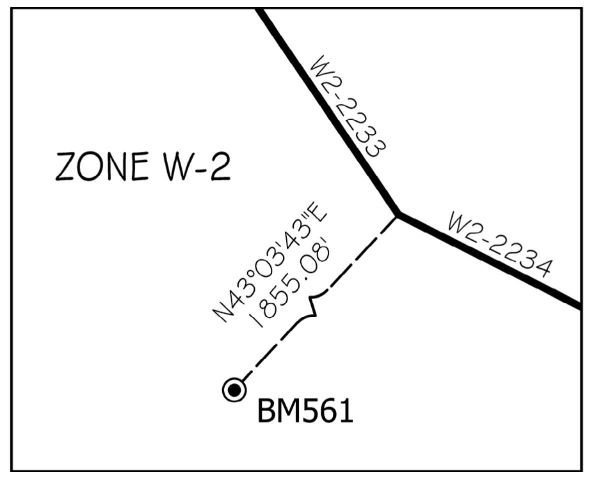
DETAIL 2W
N.T.S.



DETAIL 2X
N.T.S.



DETAIL 2Y
N.T.S.



DETAIL 2Z
N.T.S.

(ALL DETAILS SHOWN)

LEGEND

● - NGS / SCVWD MONUMENT

– – – – – - GPS VECTOR (GRID TIE)

——— - SCVWD ZONE W-2

NOTE

1. LINE TABLE SHOWN ON SHEETS 9-12 REPRESENTS THE COURSES OF ZONE W-2 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN ON DETAIL 2A.
2. SEE SHEETS 5-8 FOR LOCATION ON ZONE W-2 EXCEPTION AREAS 1-9.

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

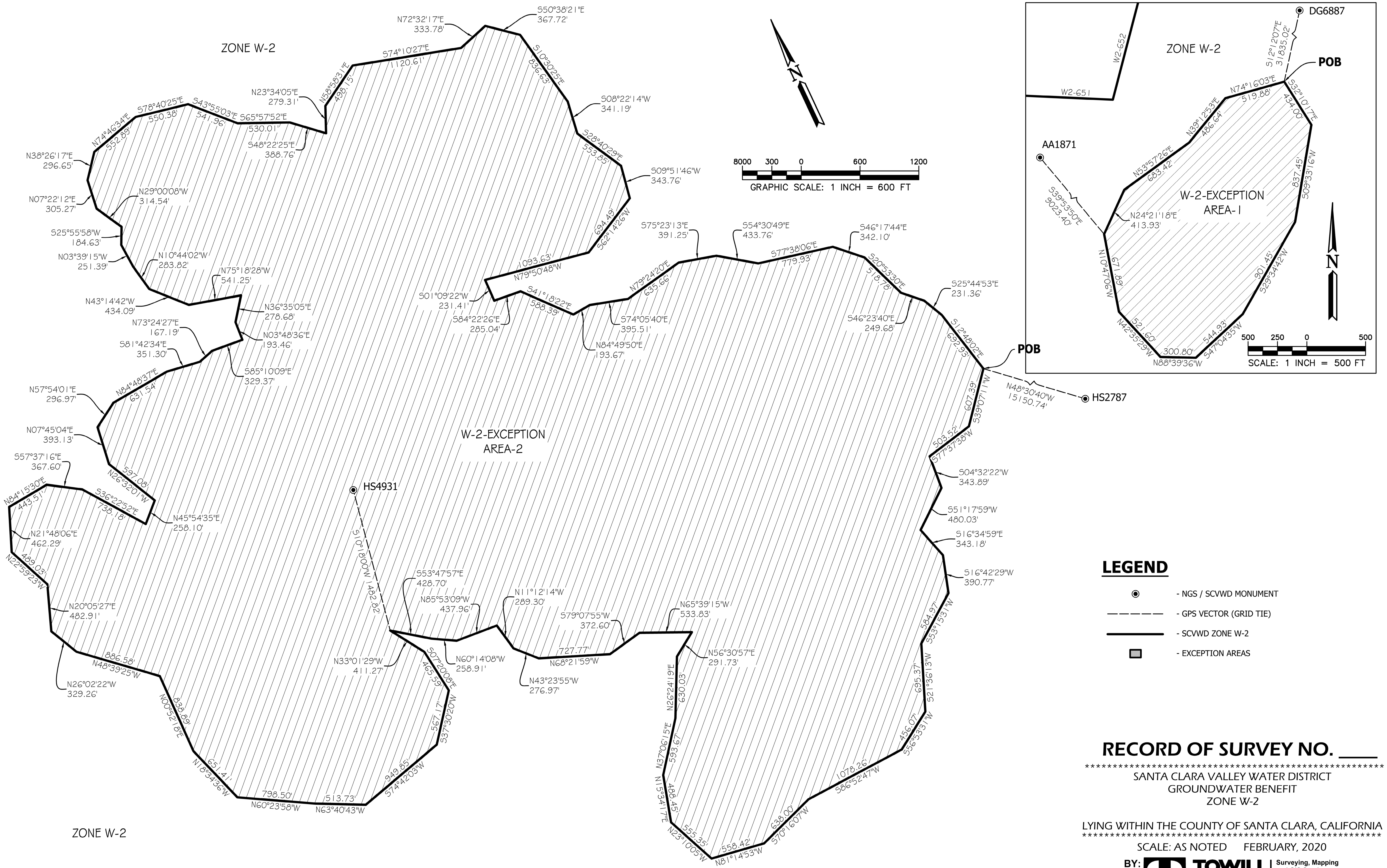
****

SCALE: AS NOTED FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 5 OF 21



LEGEND

◉ - NGS / SCVWD MONUMENT
– – – – – - GPS VECTOR (GRID TIE)
—— - SCVWD ZONE W-2
▨ - EXCEPTION AREAS

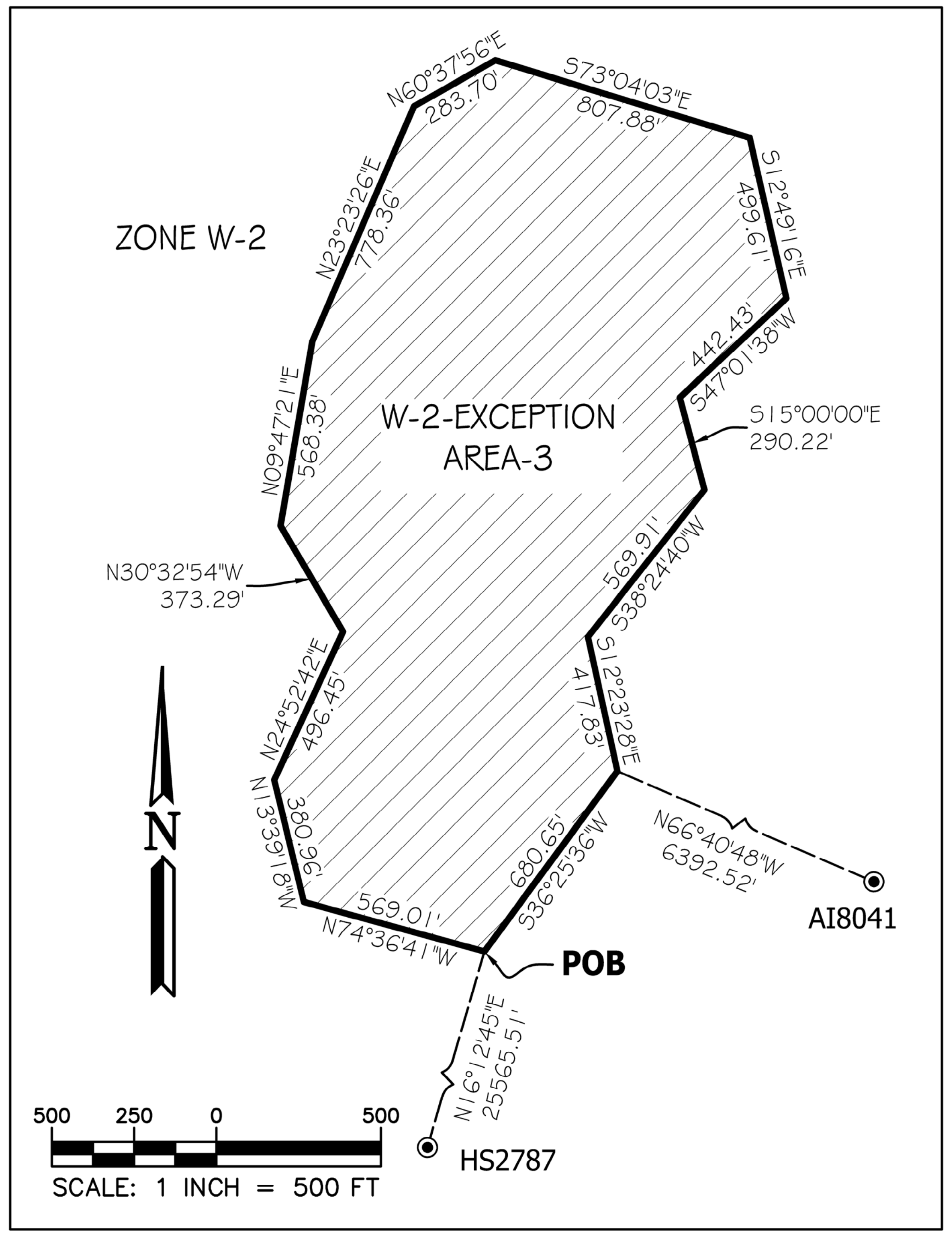
RECORD OF SURVEY NO. ____

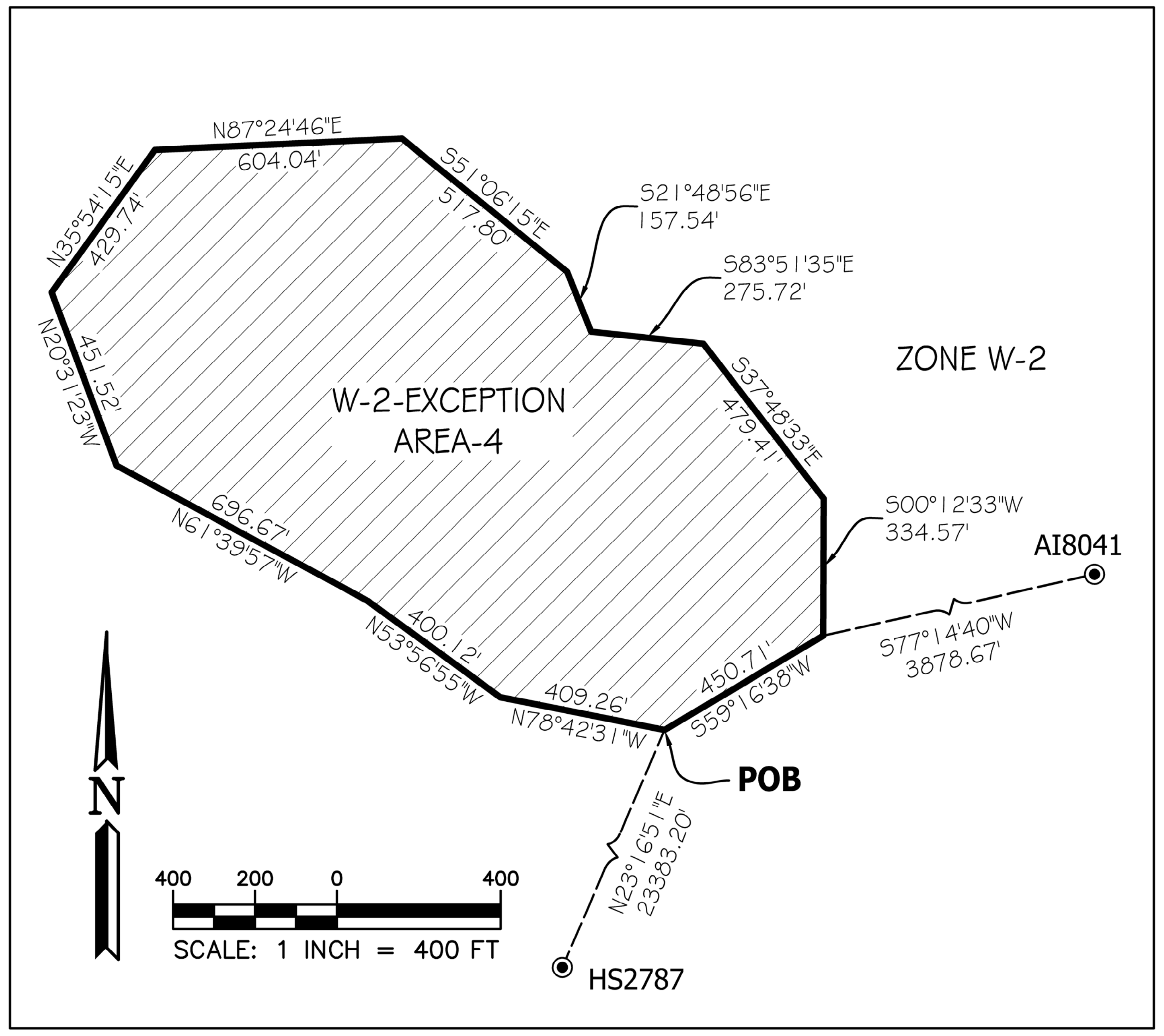
****
SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

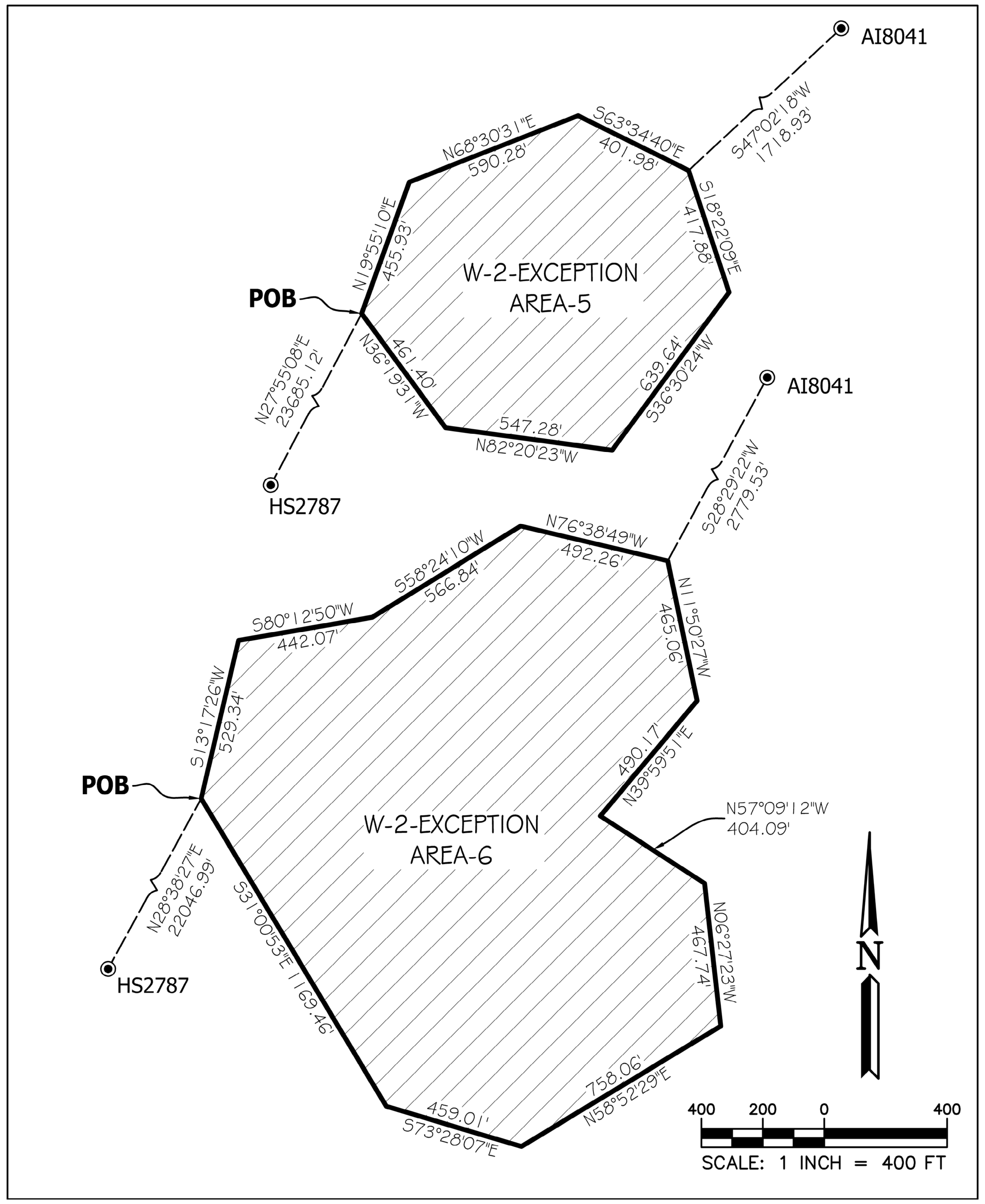
LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA
****
SCALE: AS NOTED FEBRUARY, 2020

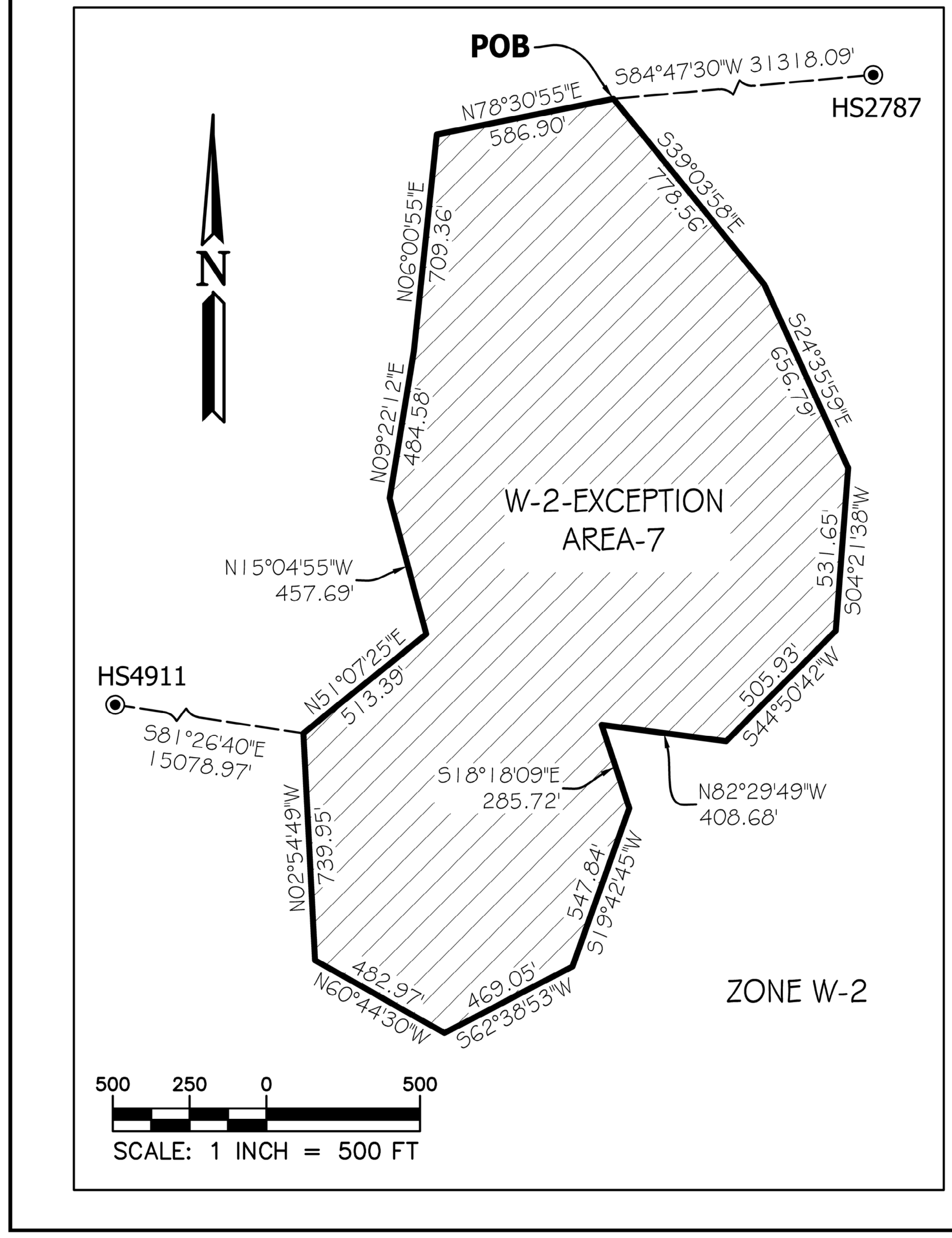
BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

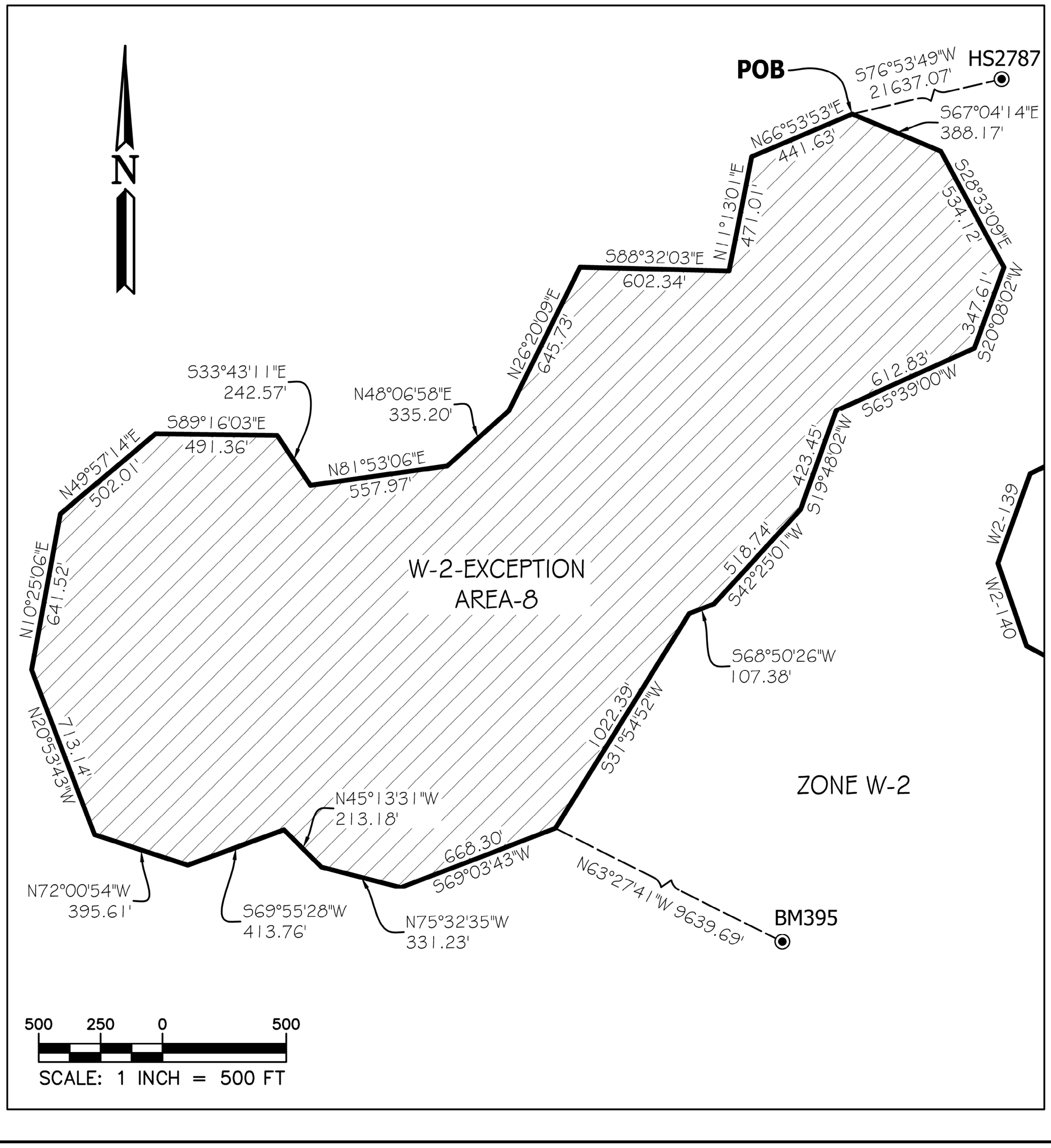
JOB NO. 16310











LEGEND

◉ - NGS / SCVWD MONUMENT

– – – – – - GPS VECTOR (GRID TIE)

—— - SCVWD ZONE W-2

▨ - EXCEPTION AREAS

RECORD OF SURVEY NO. ____

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

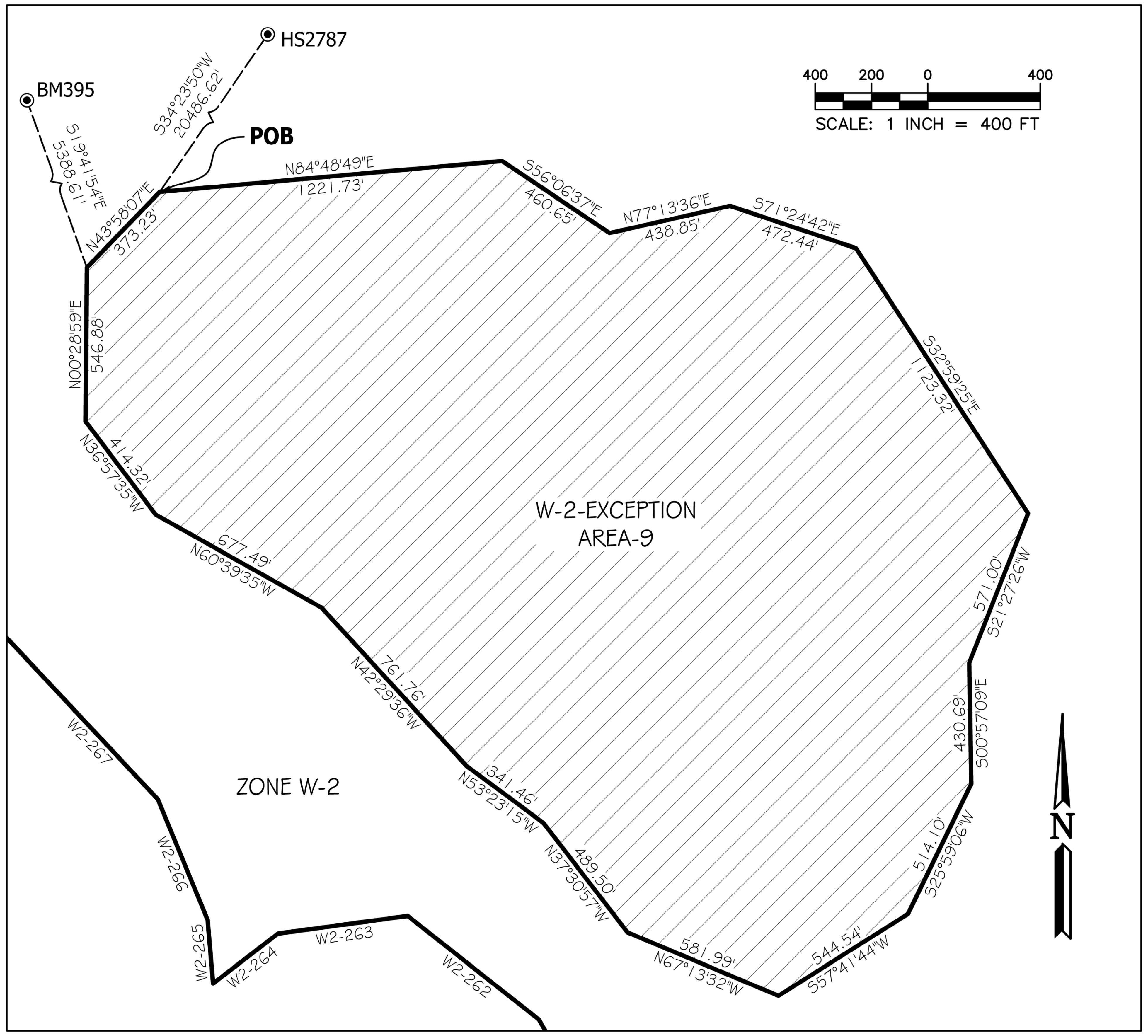
LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

BY: **TOWILL** Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 7 OF 21



LEGEND

◉ - NGS / SCVWD MONUMENT

— — — — — - GPS VECTOR (GRID TIE)

———— - SCVWD ZONE W-2

▨ - EXCEPTION AREAS

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: 1"=400' FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1	N18°16'06"W	207.72'
W2-2	N38°34'15"W	230.57'
W2-3	N55°49'22"W	194.60'
W2-4	N73°58'22"W	1248.42'
W2-5	S85°40'12"W	531.45'
W2-6	S71°02'34"W	595.55'
W2-7	N79°33'50"W	601.94'
W2-8	S64°34'19"W	431.47'
W2-9	S18°43'39"W	520.35'
W2-10	S10°51'49"E	246.26'
W2-11	S54°59'13"E	363.47'
W2-12	S36°04'25"W	481.71'
W2-13	S21°11'51"W	168.46'
W2-14	S00°16'06"W	382.68'
W2-15	S42°35'17"W	167.93'
W2-16	S10°21'35"W	372.87'
W2-17	S18°17'07"E	463.19'
W2-18	S43°01'20"E	328.06'
W2-19	S59°22'36"E	309.07'
W2-20	S20°08'58"E	142.25'
W2-21	N80°34'49"W	429.10'
W2-22	S65°01'29"W	413.26'
W2-23	S21°40'50"W	435.09'
W2-24	S46°01'08"W	211.91'
W2-25	N10°33'03"E	335.74'
W2-26	N14°56'22"W	410.61'
W2-27	N61°06'21"W	288.18'
W2-28	S75°09'48"W	390.79'
W2-29	N81°20'03"W	126.87'
W2-30	N28°43'41"W	375.79'
W2-31	N62°56'45"W	484.09'
W2-32	N29°03'59"W	574.63'
W2-33	N65°25'27"W	347.91'
W2-34	N83°53'51"W	782.98'
W2-35	S76°08'07"W	704.68'
W2-36	S54°39'04"W	333.57'
W2-37	S20°15'50"W	376.00'
W2-38	S21°01'42"E	473.01'
W2-39	S61°17'20"E	278.15'
W2-40	S83°49'32"E	526.30'
W2-41	S05°00'54"W	318.47'
W2-42	S86°51'40"W	154.23'
W2-43	N68°54'01"W	662.68'
W2-44	S77°46'16"W	176.06'
W2-45	S62°12'24"W	470.24'
W2-46	N28°26'17"W	1098.12'
W2-47	N54°18'30"W	607.05'
W2-48	N74°26'02"W	392.17'
W2-49	N33°30'56"W	282.50'
W2-50	N56°22'35"W	425.67'
W2-51	S85°30'35"W	239.09'
W2-52	N29°45'34"W	268.03'
W2-53	N50°08'14"W	738.29'
W2-54	N05°08'21"W	392.73'
W2-55	N27°46'35"W	352.96'
W2-56	N59°51'03"W	278.37'
W2-57	S69°28'13"W	336.32'
W2-58	N74°57'43"W	542.69'
W2-59	S88°26'40"W	1909.71'
W2-60	S79°59'33"W	439.17'
W2-61	S63°50'20"W	732.60'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-62	N56°04'00"W	227.34'
W2-63	N25°24'30"E	464.58'
W2-64	N18°04'03"W	296.63'
W2-65	N63°43'30"W	433.27'
W2-66	S80°08'34"W	915.09'
W2-67	N28°27'50"W	252.88'
W2-68	N64°24'52"W	305.68'
W2-69	S72°45'29"W	398.16'
W2-70	N74°55'52"W	173.86'
W2-71	N52°42'00"W	226.02'
W2-72	N79°47'58"W	299.39'
W2-73	N46°43'11"E	284.11'
W2-74	N76°34'43"E	426.58'
W2-75	N42°35'47"E	325.12'
W2-76	N60°36'04"E	503.70'
W2-77	N13°01'41"E	561.69'
W2-78	N17°17'21"W	501.20'
W2-79	N44°04'50"W	291.08'
W2-80	N80°00'03"W	240.83'
W2-81	S61°17'12"W	1085.75'
W2-82	N53°19'49"W	467.60'
W2-83	S73°57'53"W	537.74'
W2-84	S31°58'13"W	349.22'
W2-85	S01°01'06"W	562.53'
W2-86	S25°38'22"W	314.06'
W2-87	N44°13'22"W	427.39'
W2-88	N81°45'37"W	468.46'
W2-89	S55°14'55"W	235.37'
W2-90	S34°13'40"W	324.38'
W2-91	S78°01'52"W	295.78'
W2-92	N82°13'23"W	548.14'
W2-93	S78°07'56"W	340.08'
W2-94	S57°06'10"W	574.08'
W2-95	S32°35'34"W	413.83'
W2-96	N74°50'54"W	346.13'
W2-97	S75°34'33"W	314.25'
W2-98	S75°34'33"W	272.10'
W2-99	N32°20'45"W	411.02'
W2-100	N54°26'29"W	301.96'
W2-101	N70°10'38"W	2161.42'
W2-102	N78°22'53"W	820.47'
W2-103	N56°16'17"W	426.95'
W2-104	N41°39'54"W	501.29'
W2-105	N85°09'21"W	533.37'
W2-106	N48°53'16"W	299.71'
W2-107	N81°29'51"W	264.28'
W2-108	N37°19'26"E	307.01'
W2-109	N04°47'49"E	433.81'
W2-110	N41°21'23"W	544.14'
W2-111	N81°28'05"W	538.04'
W2-112	S54°17'57"W	340.17'
W2-113	N38°00'38"W	353.64'
W2-114	N81°29'21"W	969.62'
W2-115	N61°05'49"W	1243.40'
W2-116	N39°06'21"W	574.15'
W2-117	N49°34'06"E	530.63'
W2-118	N07°31'51"E	549.32'
W2-119	N35°01'37"W	358.28'
W2-120	N62°43'36"W	338.63'
W2-121	N38°09'26"W	487.76'
W2-122	N89°09'10"W	592.07'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-123	N72°52'25"W	678.77'
W2-124	S84°31'45"W	150.51'
W2-125	S58°46'36"W	1091.22'
W2-126	S42°17'29"W	181.40'
W2-127	S00°24'31"W	285.93'
W2-128	S30°40'47"E	689.74'
W2-129	S80°47'00"E	581.68'
W2-130	S55°43'41"E	329.81'
W2-131	S13°23'14"W	299.93'
W2-132	S09°00'35"E	249.76'
W2-133	S73°15'50"W	256.93'
W2-134	S51°21'00"W	502.07'
W2-135	S35°41'07"W	367.39'
W2-136	N26°15'00"W	328.08'
W2-137	N80°37'30"W	270.80'
W2-138	S64°11'54"W	657.35'
W2-139	S19°49'29"W	384.49'
W2-140	S19°05'27"E	354.45'
W2-141	S62°00'51"E	345.15'
W2-142	N66°14'32"E	495.11'
W2-143	N37°07'31"E	214.98'
W2-144	S08°23'33"E	466.58'
W2-145	S41°05'26"E	645.01'
W2-146	S65°53'55"E	393.17'
W2-147	S84°14'11"E	624.55'
W2-148	S71°42'56"W	742.17'
W2-149	S07°48'20"W	469.44'
W2-150	S37°22'35"E	747.32'
W2-151	S52°47'04"E	836.67'
W2-152	S71°25'55"E	960.11'
W2-153	S61°52'09"E	446.50'
W2-154	N85°14'42"E	564.78'
W2-155	S55°41'37"E	751.77'
W2-156	N78°27'09"E	330.22'
W2-157	S22°44'17"W	278.19'
W2-158	S08°08'02"E	328.04'
W2-159	S48°21'55"E	464.61'
W2-160	S71°33'28"E	224.57'
W2-161	S23°10'21"E	300.84'
W2-162	S53°19'47"E	1191.41'
W2-163	S73°00'50"E	341.56'
W2-164	N87°29'49"E	968.11'
W2-165	N60°45'32"E	666.48'
W2-166	S34°14'40"E	712.16'
W2-167	S77°51'03"E	211.17'
W2-168	S20°47'45"W	310.40'
W2-169	S00°57'08"E	243.13'
W2-170	S29°03'16"E	695.85'
W2-171	S62°46'07"E	724.34'
W2-172	S77°45'33"E	383.61'
W2-173	S28°12'18"W	395.61'
W2-174	S24°30'19"E	445.74'
W2-175	S69°14'05"E	1718.40'
W2-176	S60°37'22"E	1422.09'
W2-177	S85°16'57"E	281.02'
W2-178	S61°24'42"E	315.10'
W2-179	S20°53'44"E	433.49'
W2-180	S40°16'24"E	196.73'
W2-181	S57°43'12"E	685.00'
W2-182	S88°07'11"E	483.31'
W2-183	S22°08'16"E	187.34'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-184	S49°45'03"E	616.16'
W2-185	S38°04'22"E	533.04'
W2-186	S38°04'22"E	361.86'
W2-187	S62°25'02"E	527.05'
W2-188	N87°04'43"E	426.73'
W2-189	S26°35'34"E	128.49'
W2-190	S44°00'30"E	524.85'
W2-191	S86°39'20"E	484.45'
W2-192	N78°38'23"E	648.34'
W2-193	S78°48'35"E	317.54'
W2-194	N80°45'03"E	334.59'
W2-195	S73°53'44"E	526.97'
W2-196	N82°25'10"E	655.80'
W2-197	N56°18'50"E	468.74'
W2-198	N76°45'35"E	230.12'
W2-199	S14°33'21"E	242.41'
W2-200	S32°31'01"E	789.53'
W2-201	S26°15'46"E	559.32'
W2-202	S47°08'15"E	233.81'
W2-203	S71°27'20"E	590.56'
W2-204	S03°29'07"E	209.33'
W2-205	S60°02'26"W	370.31'
W2-206	S18°10'25"W	466.87'
W2-207	S02°50'15"E	693.97'
W2-208	S15°12'07"E	225.65'
W2-209	S66°25'54"E	657.11'
W2-210	S83°54'00"W	259.57'
W2-211	N67°48'23"W	316.06'
W2-212	S72°55'03"W	356.26'
W2-213	S33°42'29"W	411.88'
W2-214	S15°05'19"E	678.76'
W2-215	N41°43'43"W	882.25'
W2-216	N63°45'16"W	485.99'
W2-217	N83°25'51"W	178.47'
W2-218	N43°08'48"W	267.27'
W2-219	N76°21'13"W	328.95'
W2-220	S78°53'37"W	307.55'
W2-221	S69°10'09"W	360.20'
W2-222	N24°03'36"W	504.67'
W2-223	N85°07'38"W	420.32'
W2-224	S57°56'28"W	404.70'
W2-225	N47°47'54"W	144.06'
W2-226	N70°24'06"W	252.03'
W2-227	N45°34'48"W	364.22'
W2-228	N73°22'22"W	265.77'
W2-229	S82°44'03"W	632.80'
W2-230	N65°53'29"W	377.87'
W2-231	N35°47'13"W	144.85'
W2-232	N65°22'48"W	311.31'
W2-233	N27°27'29"W	402.21'
W2-234	N86°22'08"W	275.76'
W2-235	S51°49'39"W	503.79'
W2-236	S84°01'34"W	164.82'
W2-237	S44°11'44"W	308.18'
W2-238	S14°07'32"E	489.48'
W2-239	S03°24'30"E	488.23'
W2-240	S32°06'00"W	319.51'
W2-241	S14°55'31"E	483.23'
W2-242	S21°03'26"W	116.31'
W2-243	N60°24'43"W	311.35'
W2-244	N36°59'32"W	231.78'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-245	N57°41'48"W	298.25'
W2-246	N42°08'24"W	725.21'
W2-247	N59°41'50"W	333.14'
W2-248	N36°02'48"W	161.70'
W2-249	N59°51'38"W	302.09'
W2-250	N45°45'01"W	253.40'
W2-251	N68°28'03"W	333.71'
W2-252	N32°57'43"W	190.56'
W2-253	N52°45'05"W	655.32'
W2-254	N81°32'10"W	427.85'
W2-255	S65°29'51"W	283.26'
W2-256	N66°46'45"W	438.23'
W2-257	N87°41'59"W	148.85'
W2-258	N64°13'05"W	386.20'
W2-259	N23°19'30"W	238.43'
W2-260	N40°50'29"W	555.89'
W2-261	N30°03'16"W	1002.64'
W2-262	N51°38'54"W	594.43'
W2-263	S82°14'21"W	465.11'
W2-264	S52°28'27"W	291.31'
W2-265	N04°56'01"W	226.71'
W2-266	N22°24'06"W	463.73'
W2-267	N43°06'03"W	1242.29'
W2-268	N53°02'19"W	1419.74'
W2-269	S82°45'40"W	309.43'
W2-270	S32°44'49"W	307.65'
W2-271	N23°19'41"W	630.57'
W2-272	N47°46'58"W	981.43'
W2-273	N70°30'32"W	489.66'
W2-274	S77°03'52"W	403.30'
W2-275	S41°42'48"W	494.61'
W2-276	N35°31'47"W	228.91'
W2-277	N84°37'06"W	508.54'
W2-278	S48°50'26"W	316.07'
W2-279	N53°38'30"W	528.50'
W2-280	N76°50'59"W	585.90'
W2-281	S67°45'41"W	374.92'
W2-282	N33°49'33"W	267.09'
W2-283	N70°40'48"W	661.47'
W2-284	S63°39'31"W	248.90'
W2-285	S33°24'23"W	433.65'
W2-286	S76°33'07"W	242.30'
W2-287	S36°13'41"W	245.33'
W2-288	S14°16'21"W	156.67'
W2-289	N17°41'18"W	588.34'
W2-290	N69°41'40"W	296.03'
W2-291	N31°14'31"W	210.29'
W2-292	N55°43'01"W	221.13'
W2-293	N50°46'13"E	685.69'
W2-294	N06°14'23"E	235.36'
W2-295	N36°31'11"W	787.03'
W2-296	N56°38'54"W	417.04'
W2-297	N83°46'40"W	435.31'
W2-298	S69°44'58"W	210.21'
W2-299	S49°14'57"W	654.79'
W2-300	N65°22'50"W	379.83'
W2-301	N89°49'03"W	339.59'
W2-302	N03°47'00"W	307.04'
W2-303	N27°16'02"W	293.72'
W2-304	N04°30'11"E	161.19'
W2-305	N24°34'00"W	291.55'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-306	N50°23'09"W	367.04'
W2-307	N25°26'47"W	212.76'
W2-308	N44°23'26"W	168.57'
W2-309	N00°53'39"W	110.80'
W2-310	N79°12'22"E	395.85'
W2-311	N52°31'35"E	441.54'
W2-312	N19°13'34"E	365.72'
W2-313	N32°28'16"W	796.86'
W2-314	N07°13'24"W	565.19'
W2-315	N65°29'22"W	430.26'
W2-316	S63°27'22"W	288.36'
W2-317	S80°16'23"W	391.65'
W2-318	N61°56'53"W	470.01'
W2-319	N88°21'58"W	652.41'
W2-320	N05°19'40"W	333.49'
W2-321	N56°38'33"W	355.45'
W2-322	S73°35'33"W	519.79'
W2-323	S33°52'18"W	597.52'
W2-324	S10°16'19"E	278.44'
W2-325	S62°18'49"W	165.78'
W2-326	S24°43'35"W	255.61'
W2-327	N74°35'53"W	128.61'
W2-328	N85°56'31"W	779.14'
W2-329	S60°54'02"W	617.77'
W2-330	S34°32'52"W	222.83'
W2-331	S65°56'24"W	155.79'
W2-332	S52°10'08"W	758.25'
W2-333	S80°36'10"W	395.27'
W2-334	S56°30'19"W	470.10'
W2-335	S12°37'18"W	660.09'
W2-336	N83°08'11"W	259.11'
W2-337	S80°59'15"W	1182.20'
W2-338	N49°15'09"E	3.69'
W2-339	N15°24'41"E	1096.60'
W2-340	N52°28'30"E	1104.33'
W2-341	N30°42'56"E	787.68'
W2-342	N02°35'09"E	535.56'
W2-343	N26°09'44"W	292.90'
W2-344	N42°45'39"E	227.73'
W2-345	N05°00'50"E	202.38'
W2-346	N14°28'51"W	481.76'
W2-347	N29°03'03"W	734.68'
W2-348	N52°42'56"W	664.43'
W2-349	N78°45'07"W	524.72'
W2-350	N56°11'27"W	963.57'
W2-351	N83°10'59"W	618.76'
W2-352	S52°18'37"W	358.90'
W2-353	S02°49'11"W	421.36'
W2-354	S22°26'30"E	558.32'
W2-355	N53°49'48"W	522.72'
W2-356	S85°18'58"W	191.92'
W2-357	N45°19'04"W	259.69'
W2-358	N68°38'55"W	173.26'
W2-359	N39°25'20"W	743.21'
W2-360	N59°00'44"W	220.00'
W2-361	S85°39'29"W	355.03'
W2-362	S53°10'16"W	228.97'
W2-363	S83°19'43"W	205.32'
W2-364	N41°23'45"W	211.08'
W2-365	N60°07'19"W	210.66'
W2-366	S84°52'16"W	302.46'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-367	N62°42'50"W	1460.32'
W2-368	N54°35'20"W	374.46'
W2-369	N62°35'25"W	848.58'
W2-370	N75°09'49"W	228.51'
W2-371	N81°34'28"W	500.77'
W2-372	S89°09'26"W	1994.00'
W2-373	S55°44'40"W	588.87'
W2-374	N84°52'29"W	320.72'
W2-375	S52°32'13"W	537.56'
W2-376	S01°50'11"W	642.86'
W2-377	S44°38'25"W	412.66'
W2-378	S01°58'48"E	343.34'
W2-379	S56°15'37"W	138.00'
W2-380	S31°28'41"W	375.83'
W2-381	S00°13'04"W	549.44'
W2-382	S57°25'36"W	476.22'
W2-383	S32°40'15"W	234.95'
W2-384	S11°41'22"W	1265.17'
W2-385	S26°46'29"W	361.82'
W2-386	N37°46'12"W	166.78'
W2-387	N51°39'45"W	294.37'
W2-388	N69°50'44"W	603.01'
W2-389	S89°32'21"W	439.36'
W2-390	S60°22'57"W	244.04'
W2-391	N15°18'03"W	246.53'
W2-392	N41°25'09"W	311.52'
W2-393	N76°19'56"W	405.22'
W2-394	S55°42'19"W	419.33'
W2-395	S17°55'56"W	501.90'
W2-396	S04°58'59"E	647.89'
W2-397	S26°32'05"W	188.80'
W2-398	S02°43'39"W	412.97'
W2-399	S42°07'33"W	498.71'
W2-400	N08°21'44"W	424.87'
W2-401	N45°42'44"E	302.11'
W2-402	N07°27'22"W	409.88'
W2-403	N05°36'32"E	308.84'
W2-404	N28°42'56"W	256.52'
W2-405	N54°18'58"W	757.31'
W2-406	S83°27'06"W	212.28'
W2-407	S46°47'13"W	647.09'
W2-408	S69°03'30"W	380.33'
W2-409	S30°37'19"W	712.21'
W2-410	S10°51'38"W	197.52'
W2-411	S25°15'19"E	1277.82'
W2-412	S46°16'54"E	382.38'
W2-413	S72°19'17"E	392.31'
W2-414	S12°01'35"E	221.29'
W2-415	S44°42'44"W	258.36'
W2-416	N64°32'29"W	408.01'
W2-417	N40°10'22"W	518.10'
W2-418	N50°49'19"W	1153.57'
W2-419	N71°44'24"W	1849.03'
W2-420	N85°32'57"W	335.84'
W2-421	S68°25'37"W	544.66'
W2-422	S46°56'08"W	778.32'
W2-423	N21°49'25"W	232.18'
W2-424	N68°13'02"W	547.30'
W2-425	N05°32'32"W	557.84'
W2-426	N20°33'31"W	271.95'
W2-427	N45°52'59"E	379.00'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-428	N13°59'24"E	319.85'
W2-429	N09°35'00"W	638.30'
W2-430	N41°22'40"E	470.39'
W2-431	N15°27'31"E	623.49'
W2-432	N22°07'33"E	642.47'
W2-433	N41°25'59"E	1245.48'
W2-434	N10°45'40"E	686.65'
W2-435	N27°27'22"E	842.87'
W2-436	N39°16'26"E	1067.35'
W2-437	N51°36'51"E	651.66'
W2-438	N69°19'57"E	257.35'
W2-439	S86°13'29"E	491.39'
W2-440	N49°29'59"E	265.43'
W2-441	N25°38'19"E	667.52'
W2-442	N35°09'15"E	514.18'
W2-443	N62°27'59"E	931.88'
W2-444	N10°34'33"E	830.07'
W2-445	N04°28'10"W	848.34'
W2-446	N19°54'09"E	202.77'
W2-447	N59°30'15"E	589.40'
W2-448	N72°01'22"E	146.74'
W2-449	N32°44'20"E	291.36'
W2-450	N14°57'32"W	343.71'
W2-451	N59°33'37"W	598.97'
W2-452	N32°42'08"W	503.11'
W2-453	N46°36'33"W	262.25'
W2-454	N14°57'02"W	332.03'
W2-455	N46°04'51"W	579.74'
W2-456	N78°58'44"W	265.85'
W2-457	N35°08'15"W	366.48'
W2-458	N59°19'34"W	797.81'
W2-459	N49°45'22"W	453.52'
W2-460	N70°56'28"W	246.47'
W2-461	N40°56'47"W	717.58'
W2-462	N77°38'46"W	390.16'
W2-463	S59°57'37"W	758.16'
W2-464	N00°03'56"E	449.66'
W2-465	N42°59'40"W	574.01'
W2-466	N72°16'25"W	394.31'
W2-467	N88°02'02"W	152.54'
W2-468	N49°38'33"W	132.49'
W2-469	N62°44'18"W	479.19'
W2-470	S86°43'55"W	412.66'
W2-471	S59°18'54"W	405.84'
W2-472	S31°38'57"W	148.46'
W2-473	N55°21'44"W	159.21'
W2-474	N12°50'55"W	233.65'
W2-475	N38°15'21"W	282.29'
W2-476	N65°44'25"W	276.01'
W2-477	S63°35'26"W	420.04'
W2-478	S27°10'52"W	716.32'
W2-479	S17°46'28"E	466.91'
W2-480	S23°41'52"W	268.75'
W2-481	S05°08'59"W	518.86'
W2-482	S28°44'31"W	383.69'
W2-483	N07°09'31"E	675.90'
W2-484	N25°24'44"W	497.77'
W2-485	N52°31'16"W	453.69'
W2-486	S89°06'09"W	712.62'
W2-487	N20°49'45"W	737.38'
W2-488	N77°00'58"W	399.58'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-489	N49°52'42"W	921.81'
W2-490	N78°36'03"W	430.59'
W2-491	S59°09'42"W	551.62'
W2-492	S19°17'40"W	943.45'
W2-493	S46°51'58"W	1172.37'
W2-494	S23°35'05"W	2132.64'
W2-495	S02°43'25"E	948.55'
W2-496	S29°04'10"W	1124.88'
W2-497	S03°00'37"W	217.87'
W2-498	S25°09'56"W	417.32'
W2-499	S05°53'24"W	216.61'
W2-500	S18°27'39"E	537.26'
W2-501	S75°53'20"E	579.84'
W2-502	S44°02'22"E	992.88'
W2-503	N89°42'54"E	979.32'
W2-504	S68°55'45"E	389.72'
W2-505	N79°23'20"E	634.46'
W2-506	S49°26'32"E	326.36'
W2-507	S00°55'14"W	3219.64'
W2-508	S43°23'59"W	708.90'
W2-509	N10°31'34"W	452.33'
W2-510	N50°38'11"W	188.46'
W2-511	N23°31'02"E	243.03'
W2-512	N06°37'09"E	826.98'
W2-513	N10°53'59"W	458.93'
W2-514	N39°23'06"W	373.92'
W2-515	N69°29'10"W	233.21'
W2-516	N40°46'44"W	172.91'
W2-517	N74°44'18"W	614.66'
W2-518	N54°01'16"W	1371.41'
W2-519	N89°25'24"W	584.46'
W2-520	S63°48'20"W	1256.57'
W2-521	S51°00'37"W	471.07'
W2-522	S38°20'16"W	346.05'
W2-523	S38°20'16"W	447.76'
W2-524	N09°31'04"W	393.94'
W2-525	N52°59'39"W	279.37'
W2-526	N12°31'59"E	933.82'
W2-527	N04°35'25"W	503.85'
W2-528	N22°05'42"W	1121.10'
W2-529	N40°35'50"W	281.79'
W2-530	N11°48'31"E	546.26'
W2-531	N23°03'45"W	458.37'
W2-532	N52°44'29"W	1443.70'
W2-533	N75°19'30"W	455.51'
W2-534	S80°13'45"W	573.83'
W2-535	N33°02'16"W	1248.55'
W2-536	N55°49'54"W	463.81'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-537	S83°13'04"W	739.24'
W2-538	S50°18'59"W	268.65'
W2-539	N14°50'26"E	544.27'
W2-540	N01°05'54"E	930.97'
W2-541	N28°25'14"E	599.52'
W2-542	N13°0[illegible]"W	275.30'
W2-543	N33°46'47"E	204.30'
W2-544	N07°50'14"E	324.50'
W2-545	N18°35'37"W	554.72'
W2-546	N43°13'21"W	109.72'
W2-547	N19°12'01"E	230.74'
W2-548	N00°58'39"W	1068.93'
W2-549	N65°12'25"E	637.46'
W2-550	N52°13'41"E	642.19'
W2-551	N23°08'44"E	740.23'
W2-552	N28°18'18"E	552.33'
W2-553	N25°28'00"E	358.46'
W2-554	N04°42'21"W	800.98'
W2-555	N24°29'55"W	487.68'
W2-556	N70°37'53"W	289.80'
W2-557	S58°09'45"W	349.84'
W2-558	N30°50'27"W	585.23'
W2-559	N74°07'53"W	436.76'
W2-560	N24°05'07"W	395.75'
W2-561	N74°25'39"W	309.83'
W2-562	S50°37'30"W	472.24'
W2-563	N01°07'09"E	493.25'
W2-564	N27°54'16"W	222.69'
W2-565	N45°02'26"E	897.16'
W2-566	N05°41'16"E	539.45'
W2-567	N18°29'55"W	381.13'
W2-568	N53°40'52"W	146.77'
W2-569	N07°20'12"W	405.31'
W2-570	N02°29'31"E	692.25'
W2-571	N19°21'38"W	639.57'
W2-572	N55°54'50"W	199.15'
W2-573	N08°50'50"E	294.98'
W2-574	N26°10'16"W	690.24'
W2-575	N42°06'24"W	795.86'
W2-576	N58°27'58"W	277.88'
W2-577	N26°17'41"W	250.89'
W2-578	N47°58'39"W	384.46'
W2-579	N65°36'25"W	462.35'
W2-580	N79°22'18"W	156.71'
W2-581	N50°47'48"W	146.76'
W2-582	N09°48'27"W	311.70'
W2-583	N47°18'28"W	615.32'
W2-584	N73°19'20"W	385.56'

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: TOWILL Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 9 OF 21

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-585	N17°47'35"W	123.69'
W2-586	N31°16'55"W	363.79'
W2-587	N48°32'44"W	342.51'
W2-588	N70°31'05"W	113.10'
W2-589	N16°46'13"W	219.93'
W2-590	N52°20'25"W	204.44'
W2-591	N10°01'04"W	401.71'
W2-592	N51°34'22"W	399.45'
W2-593	N01°37'21"W	207.12'
W2-594	N38°55'31"W	396.01'
W2-595	N51°00'12"W	562.42'
W2-596	N68°32'51"W	197.38'
W2-597	N33°45'59"W	130.83'
W2-598	N46°08'00"W	381.30'
W2-599	S45°06'01"W	338.81'
W2-600	N39°05'06"W	339.94'
W2-601	N61°29'23"W	237.08'
W2-602	N25°32'04"E	344.52'
W2-603	N72°19'01"W	500.48'
W2-604	N82°30'06"W	228.16'
W2-605	S68°03'47"W	308.82'
W2-606	N84°52'14"W	220.26'
W2-607	S63°58'41"W	436.97'
W2-608	S21°53'58"W	270.88'
W2-609	S64°07'40"W	337.61'
W2-610	S29°32'13"W	236.68'
W2-611	N37°15'09"W	185.39'
W2-612	N71°28'58"W	210.61'
W2-613	S72°48'41"W	439.24'
W2-614	S35°42'33"W	494.38'
W2-615	N33°03'51"W	212.60'
W2-616	N47°36'26"E	246.59'
W2-617	N09°48'13"E	260.34'
W2-618	N49°04'08"E	495.66'
W2-619	N05°28'59"E	238.54'
W2-620	N05°28'59"E	164.58'
W2-621	N83°30'51"E	221.48'
W2-622	S73°15'21"E	418.05'
W2-623	N85°22'15"E	500.60'
W2-624	N46°52'16"E	366.41'
W2-625	N10°28'29"W	366.57'
W2-626	N51°10'27"W	284.13'
W2-627	N70°29'16"W	560.78'
W2-628	N54°52'27"W	693.21'
W2-629	N33°49'42"W	624.81'
W2-630	N48°31'09"W	399.62'
W2-631	N72°34'33"W	285.36'
W2-632	N03°10'07"E	240.56'
W2-633	N38°09'10"W	335.06'
W2-634	N09°55'47"W	218.32'
W2-635	N35°18'56"W	220.24'
W2-636	N09°38'12"E	346.50'
W2-637	N23°15'48"W	553.36'
W2-638	N49°13'50"W	295.85'
W2-639	N66°30'36"W	160.73'
W2-640	N16°55'55"W	375.09'
W2-641	N84°27'22"E	467.20'
W2-642	N51°35'38"E	486.58'
W2-643	N11°32'09"E	698.23'
W2-644	N30°49'01"E	485.38'
W2-645	N01°07'14"W	210.06'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-646	N84°06'40"E	161.07'
W2-647	S01°29'04"E	275.76'
W2-648	S50°35'08"E	689.85'
W2-649	S35°22'20"E	2237.55'
W2-650	S02°35'49"E	1424.42'
W2-651	S87°23'51"E	764.68'
W2-652	N14°33'25"E	1523.68'
W2-653	N21°11'18"W	267.76'
W2-654	N02°08'04"E	698.72'
W2-655	N27°25'45"W	166.82'
W2-656	N00°35'50"E	154.24'
W2-657	N32°51'51"W	278.39'
W2-658	N18°57'09"W	474.70'
W2-659	N07°17'27"E	339.00'
W2-660	N29°28'22"W	820.80'
W2-661	N40°04'35"W	918.69'
W2-662	N14°25'53"W	1213.86'
W2-663	N45°58'58"W	362.89'
W2-664	N35°48'13"E	524.80'
W2-665	N09°25'56"E	730.91'
W2-666	N21°16'48"W	203.89'
W2-667	N62°22'38"W	256.32'
W2-668	S81°29'18"W	149.17'
W2-669	N27°30'29"W	256.65'
W2-670	N36°03'41"W	314.74'
W2-671	N39°30'51"W	634.15'
W2-672	N48°00'37"W	260.43'
W2-673	N37°03'47"W	180.54'
W2-674	N51°35'02"W	228.25'
W2-675	N56°24'29"W	195.42'
W2-676	N45°07'43"W	1438.46'
W2-677	N45°56'45"W	3790.62'
W2-678	N52°39'14"W	584.58'
W2-679	N48°16'44"W	1084.66'
W2-680	N47°28'10"W	554.88'
W2-681	N39°36'53"W	586.11'
W2-682	N37°09'18"W	742.52'
W2-683	N44°19'13"W	4763.57'
W2-684	N45°44'30"W	3175.62'
W2-685	N45°33'31"W	109.21'
W2-686	N43°29'22"W	153.48'
W2-687	N40°42'43"W	192.66'
W2-688	N37°30'14"W	208.99'
W2-689	N33°26'34"W	284.68'
W2-690	N30°54'14"W	2946.05'
W2-691	N32°25'47"E	275.82'
W2-692	N09°57'31"W	592.97'
W2-693	N23°18'54"E	227.55'
W2-694	N01°37'50"E	569.59'
W2-695	N15°45'31"W	895.33'
W2-696	N32°21'07"W	723.15'
W2-697	N63°36'42"W	487.44'
W2-698	N24°38'55"W	663.31'
W2-699	N00°54'53"W	395.05'
W2-700	N18°41'04"W	200.25'
W2-701	N44°06'42"W	281.68'
W2-702	N15°44'37"E	448.28'
W2-703	N58°05'09"E	267.34'
W2-704	N25°48'20"E	223.23'
W2-705	N00°41'46"W	360.43'
W2-706	N42°46'53"W	648.74'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-707	N19°51'27"W	272.78'
W2-708	N35°01'17"W	1032.11'
W2-709	N30°52'04"W	975.30'
W2-710	N54°23'25"W	396.16'
W2-711	N38°18'24"W	382.48'
W2-712	N68°10'50"W	360.63'
W2-713	N48°24'34"W	616.67'
W2-714	N17°13'02"W	674.26'
W2-715	N40°39'26"W	1830.96'
W2-716	N78°13'37"W	190.09'
W2-717	N41°06'45"W	68.56'
W2-718	N18°54'29"W	211.18'
W2-719	N46°35'00"W	959.07'
W2-720	N53°36'57"W	714.21'
W2-721	N85°29'03"W	429.26'
W2-722	N71°40'15"W	575.02'
W2-723	N63°31'52"W	1583.52'
W2-724	S81°54'54"W	467.75'
W2-725	S46°46'24"W	409.81'
W2-726	S24°09'38"W	397.20'
W2-727	N61°34'21"W	793.63'
W2-728	N71°01'58"W	753.94'
W2-729	N44°00'57"W	995.00'
W2-730	N59°22'15"W	760.94'
W2-731	N84°40'03"W	211.22'
W2-732	N35°06'28"W	486.98'
W2-733	N64°04'13"W	753.48'
W2-734	N52°55'20"W	318.91'
W2-735	N69°35'10"W	188.16'
W2-736	S78°45'00"W	153.97'
W2-737	S55°18'30"W	280.93'
W2-738	N64°45'10"W	900.84'
W2-739	S48°01'31"W	581.17'
W2-740	S04°52'31"W	425.84'
W2-741	N74°30'45"W	200.94'
W2-742	S77°07'45"W	359.75'
W2-743	N80°59'45"W	268.84'
W2-744	N84°46'26"W	592.14'
W2-745	S74°48'33"W	324.67'
W2-746	N54°47'03"W	775.49'
W2-747	N86°15'00"W	210.92'
W2-748	S58°07'30"W	190.48'
W2-749	S24°22'30"W	190.48'
W2-750	S03°45'05"E	189.07'
W2-751	N51°51'00"W	165.33'
W2-752	N51°39'11"W	93.10'
W2-753	N43°42'02"W	133.26'
W2-754	N43°37'25"W	81.39'
W2-755	N42°42'32"W	10.08'
W2-756	N70°16'19"W	19.31'
W2-757	N46°04'47"W	149.81'
W2-758	N32°57'43"W	65.44'
W2-759	N33°40'14"W	16.83'
W2-760	N23°05'59"W	71.02'
W2-761	N22°35'11"W	12.32'
W2-762	N29°51'04"W	13.58'
W2-763	N30°29'35"W	77.74'
W2-764	N30°32'07"W	26.07'
W2-765	N30°39'26"W	39.80'
W2-766	N16°14'42"W	161.30'
W2-767	N06°51'41"W	42.27'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-768	N05°02'34"E	54.02'
W2-769	N24°01'22"E	18.59'
W2-770	N23°17'49"E	44.46'
W2-771	N31°19'19"E	83.49'
W2-772	N46°02'37"E	271.40'
W2-773	N41°18'30"E	275.36'
W2-774	N36°22'01"E	100.42'
W2-775	N25°36'48"E	81.68'
W2-776	N18°50'32"E	27.53'
W2-777	N18°33'14"E	18.33'
W2-778	N04°35'49"W	100.61'
W2-779	N24°20'38"W	46.75'
W2-780	N37°32'15"W	86.62'
W2-781	N19°14'06"W	57.83'
W2-782	N05°00'42"W	46.87'
W2-783	N05°20'00"W	125.66'
W2-784	N05°27'54"W	15.39'
W2-785	N05°17'08"W	13.19'
W2-786	N01°02'03"E	34.23'
W2-787	N01°02'09"E	5.83'
W2-788	N07°41'04"W	105.35'
W2-789	N17°36'34"W	149.87'
W2-790	N08°15'55"E	16.15'
W2-791	N38°33'24"W	12.76'
W2-792	N10°00'53"W	271.19'
W2-793	N17°23'41"W	107.46'
W2-794	N10°21'20"W	105.85'
W2-795	N11°03'28"W	24.95'
W2-796	N01°43'55"W	120.30'
W2-797	N29°01'54"E	76.70'
W2-798	N50°16'12"E	36.80'
W2-799	N58°04'27"E	80.98'
W2-800	N70°29'48"E	74.73'
W2-801	N85°47'48"E	111.67'
W2-802	N85°38'32"E	81.37'
W2-803	N72°40'32"E	120.23'
W2-804	N64°23'44"E	71.46'
W2-805	N53°45'39"E	52.91'
W2-806	N38°50'38"E	136.88'
W2-807	N26°42'11"E	119.98'
W2-808	N12°34'12"E	171.31'
W2-809	N27°36'29"E	44.78'
W2-810	N44°03'32"E	43.83'
W2-811	N79°18'20"E	87.78'
W2-812	N76°45'52"E	171.37'
W2-813	N82°05'42"E	89.06'
W2-814	N74°30'34"E	168.99'
W2-815	N80°12'35"E	145.44'
W2-816	N80°10'58"E	88.99'
W2-817	N58°31'11"E	104.33'
W2-818	N52°38'04"E	99.66'
W2-819	N40°38'37"E	62.39'
W2-820	N30°42'08"E	344.88'
W2-821	N31°23'42"E	20.68'
W2-822	N30°35'48"E	62.37'
W2-823	N30°12'01"E	20.85'
W2-824	N25°44'49"E	49.30'
W2-825	N25°22'41"E	115.50'
W2-826	N16°43'15"E	33.28'
W2-827	N15°54'57"E	50.86'
W2-828	N16°19'18"E	52.85'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-829	N05°54'19"E	68.33'
W2-830	N00°47'10"W	64.11'
W2-831	N16°14'31"W	60.63'
W2-832	N41°02'46"W	59.36'
W2-833	N19°48'16"W	17.14'
W2-834	N04°54'05"E	60.21'
W2-835	N35°35'34"E	74.72'
W2-836	N35°18'38"E	109.28'
W2-837	N28°38'18"E	189.83'
W2-838	N14°21'09"E	61.74'
W2-839	N07°18'13"E	199.27'
W2-840	N17°05'01"E	224.68'
W2-841	N31°50'44"E	109.38'
W2-842	N41°28'22"E	55.50'
W2-843	N55°56'15"E	58.90'
W2-844	N70°59'46"E	70.15'
W2-845	S83°15'42"E	40.26'
W2-846	S65°23'10"E	50.05'
W2-847	S43°07'30"E	86.27'
W2-848	S61°13'10"E	57.08'
W2-849	S61°16'20"E	42.30'
W2-850	S81°06'59"E	117.23'
W2-851	N77°44'52"E	131.55'
W2-852	N57°00'41"E	96.32'
W2-853	N43°48'59"E	70.95'
W2-854	N34°39'37"E	79.15'
W2-855	N22°24'42"E	43.79'
W2-856	N22°09'20"E	50.74'
W2-857	N02°46'10"E	124.22'
W2-858	N29°23'51"W	78.54'
W2-859	N34°22'54"W	127.77'
W2-860	N21°53'32"W	26.09'
W2-861	N04°39'27"E	32.11'
W2-862	N52°09'04"E	15.66'
W2-863	N74°13'10"E	41.55'
W2-864	S89°43'42"E	82.75'
W2-865	N89°38'49"E	45.30'
W2-866	S81°30'17"E	123.27'
W2-867	N89°50'13"E	105.12'
W2-868	N89°47'50"E	84.79'
W2-869	N77°57'08"E	88.52'
W2-870	N70°34'57"E	145.93'
W2-871	N70°24'30"E	58.94'
W2-872	N62°20'34"E	49.31'
W2-873	N40°38'39"E	61.92'
W2-874	N40°14'05"E	121.70'
W2-875	S87°53'05"E	57.49'
W2-876	S88°12'48"E	54.87'
W2-877	N86°32'40"E	9.32'
W2-878	N85°48'04"E	27.99'
W2-879	N84°06'19"E	9.07'
W2-880	N71°06'36"E	27.79'
W2-881	N70°55'00"E	42.36'
W2-882	N58°43'25"E	42.25'
W2-883	N58°03'15"E	10.04'
W2-884	N27°09'42"E	21.09'
W2-885	N26°54'54"E	18.62'
W2-886	N25°31'19"E	11.20'
W2-887	N07°19'33"E	47.62'
W2-888	N06°55'36"E	19.77'
W2-889	N07°11'48"E	43.21'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-890	N18°27'48"E	100.75'
W2-891	N09°51'17"E	28.37'
W2-892	N07°54'49"E	12.10'
W2-893	N24°31'49"E	30.57'
W2-894	N45°10'27"E	11.67'
W2-895	N43°18'59"E	34.95'
W2-896	N41°45'26"E	12.01'
W2-897	N43°38'24"E	12.86'
W2-898	N43°16'33"E	38.86'
W2-899	N41°36'10"E	12.94'
W2-900	N43°40'20"E	28.71'
W2-901	N42°55'04"E	23.48'
W2-902	N36°49'11"E	51.62'
W2-903	N23°54'37"E	13.44'
W2-904	N23°00'35"E	31.02'
W2-905	N23°15'52"E	76.71'
W2-906	N01°01'31"E	37.87'
W2-907	N42°08'37"W	8.49'
W2-908	N02°13'04"W	71.84'
W2-909	N14°38'45"E	144.24'
W2-910	N28°13'14"E	92.11'
W2-911	N45°28'44"E	157.11'
W2-912	N56°17'46"E	231.37'
W2-913	N47°23'49"E	110.29'
W2-914	N36°47'21"E	78.98'
W2-915	N42°25'20"E	248.03'
W2-916	N48°02'00"E	117.47'
W2-917	N33°16'03"E	146.37'
W2-918	N41°08'59"E	50.00'
W2-919	N49°22'27"E	42.74'
W2-920	N52°08'42"E	5.22'
W2-921	N62°30'49"E	41.96'
W2-922	N63°25'50"E	7.86'
W2-923	N70°55'45"E	22.26'
W2-924	N70°54'24"E	34.93'
W2-925	N88°03'37"E	119.76'
W2-926	N81°29'59"E	46.21'
W2-927	N68°35'44"E	73.49'
W2-928	N51°55'12"E	93.52'
W2-929	N52°00'29"E	60.15'
W2-930	N48°21'47"E	276.72'
W2-931	N76°08'12"E	45.36'
W2-932	N75°17'49"E	14.78'
W2-933	S62°06'12"E	32.22'
W2-934	S24°47'53"E	105.98'
W2-935	S24°56'21"E	53.05'
W2-936	N15°00'44"E	42.03'
W2-937	S45°39'01"E	43.47'
W2-938	S45°39'01"E	4.82'
W2-939	N28°10'54"E	182.52'
W2-940	N41°18'13"E	227.19'
W2-941	N31°25'12"E	89.49'
W2-942	N22°27'37"E	131.04'
W2-943	N13°43'41"E	73.90'
W2-944	N01°01'15"E	32.04'
W2-945	N24°24'01"W	41.93'
W2-946	N40°58'16"W	30.37'
W2-947	N40°43'50"W	44.90'
W2-948	N19°30'30"W	51.32'
W2-949	N05°16'16"W	34.43'
W2-950	N02°11'17"E	99.79'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-951	N11°09'10"E	193.07'
W2-952	N20°23'16"E	120.80'
W2-953	N44°38'56"E	69.42'
W2-954	N74°59'48"E	64.63'
W2-955	S78°37'15"E	58.72'
W2-956	S78°20'26"E	61.14'
W2-957	S46°18'30"E	32.77'
W2-958	S60°47'46"E	33.92'
W2-959	S49°36'47"E	59.70'
W2-960	S67°27'03"E	38.69'
W2-961	S88°58'48"E	67.93'
W2-962	N71°18'18"E	10.79'
W2-963	N67°08'28"E	10.79'
W2-964	N49°21'25"E	45.46'
W2-965	N34°19'08"E	69.27'
W2-966	N16°05'30"E	84.84'
W2-967	N23°58'57"E	56.55'
W2-968	N08°28'37"E	123.02'
W2-969	N17°21'06"E	114.58'
W2-970	N06°30'55"E	42.43'
W2-971	N16°19'09"E	77.01'
W2-972	N09°53'54"E	218.17'
W2-973	N32°29'12"E	42.26'
W2-974	N52°44'44"E	22.92'
W2-975	S88°58'50"E	27.87'
W2-976	S71°34'11"E	60.84'
W2-977	S50°50'35"E	48.35'
W2-978	S35°06'35"E	37.42'
W2-979	S50°19'31"E	51.30'
W2-980	S38°59'03"E	99.34'
W2-981	S69°01'29"E	23.47'
W2-982	N80°41'23"E	34.52'
W2-983	N60°03'33"E	46.71'
W2-984	N26°46'39"E	30.73'
W2-985	N26°49'10"E	38.02'
W2-986	N11°57'25"E	12.24'
W2-987	N10°39'39"E	22.53'
W2-988	N30°12'01"E	82.16'
W2-989	N53°28'43"E	40.63'
W2-990	N50°02'56"E	5.00'
W2-991	N71°22'32"E	37.91'
W2-992	N71°03'27"E	115.19'
W2-993	N25°36'28"E	132.54'
W2-994	N20°09'22"E	98.28'
W2-995	N21°48'22"E	16.36'
W2-996	N85°36'33"E	15.45'
W2-997	N87°36'05"E	6.11'
W2-998	N86°29'51"E	69.30'
W2-999	N69°22'02"E	24.67'
W2-1000	S74°53'57"E	261.86'
W2-1001	N88°38'34"E	105.46'
W2-1002	N66°10'12"E	68.45'
W2-1003	N52°55'16"E	50.16'
W2-1004	N35°10'23"E	20.68'
W2-1005	N15°40'51"E	49.30'
W2-1006	N05°46'18"W	81.04'
W2-1007	N01°51'45"E	39.33'
W2-1008	N04°21'18"E	29.91'
W2-1009	N27°32'52"E	40.29'
W2-1010	N56°01'42"E	13.82'
W2-1011	N56°01'42"E	35.07'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-1012	N71°35'02"E	29.55'
W2-1013	N87°34'19"E	266.66'
W2-1014	S75°03'51"E	74.16'
W2-1015	S62°28'39"E	26.92'
W2-1016	S40°35'58"E	51.14'
W2-1017	S29°22'14"E	51.07'
W2-1018	S06°45'34"E	133.03'
W2-1019	S18°47'23"E	100.23'
W2-1020	S43°56'33"E	50.94'
W2-1021	S59°14'23"E	60.18'
W2-1022	S78°50'16"E	239.74'
W2-1023	N76°02'44"E	132.51'
W2-1024	N43°29'02"E	26.65'
W2-1025	N02°07'56"E	104.15'
W2-1026	N20°11'18"E	36.24'
W2-1027	N35°52'07"E	38.60'
W2-1028	N58°32'49"E	71.22'
W2-1029	N85°49'39"E	44.30'
W2-1030	S76°26'21"E	129.06'
W2-1031	S82°38'12"E	36.22'
W2-1032	S70°09'26"E	31.59'
W2-1033	N86°05'58"E	72.25'
W2-1034	N54°29'34"E	29.98'
W2-1035	N29°00'10"E	27.21'
W2-1036	N28°16'27"E	33.59'
W2-1037	N14°35'42"E	24.72'
W2-1038	N04°[illegible]'09"W	[illegible]
W2-1039	N14°43'52"W	31.02'
W2-1040	N15°24'29"W	62.63'
W2-1041	[illegible]	[illegible]
W2-1042	N25°09'55"W	24.34'
W2-1043	N26°22'43"W	8.20'
W2-1044	N08°14'52"W	48.70'
W2-1045	N22°01'13"W	5.93'
W2-1046	N22°40'29"W	59.24'
W2-1047	N12°08'17"W	43.37'
W2-1048	N06°33'25"E	42.07'
W2-1049	N37°59'26"E	16.41'
W2-1050	N36°28'47"E	21.01'
W2-1051	N54°24'39"E	27.48'
W2-1052	N55°55'37"E	17.74'
W2-1053	N68°19'20"E	31.15'
W2-1054	N70°52'39"E	20.10'
W2-1055	N69°49'15"E	17.12'
W2-1056	N88°10'04"E	124.68'
W2-1057	N87°42'32"E	69.49'
W2-1058	N73°55'46"E	121.46'
W2-1059	N49°13'39"E	147.54'
W2-1060	N40°57'59"E	56.05'
W2-1061	N40°36'31"E	125.69'
W2-1062	N38°43'05"E	15.19'
W2-1063	N39°34'20"E	9.78'
W2-1064	N38°13'09"E	28.80'
W2-1065	N36°56'34"E	9.89'
W2-1066	N38°21'24"E	32.06'
W2-1067	N43°09'17"E	18.17'
W2-1068	N41°58'10"E	124.87'
W2-1069	N33°25'46"E	25.45'
W2-1070	N32°46'54"E	51.82'
W2-1071	N32°53'00"E	153.92'
W2-1072	N52°50'39"E	58.33'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-1073	S85°03'40"E	58.48'
W2-1074	S68°21'56"E	40.32'
W2-1075	S41°30'05"E	29.64'
W2-1076	S25°36'40"E	53.76'
W2-1077	S10°51'43"E	67.72'
W2-1078	S25°28'21"E	35.80'
W2-1079	S40°10'24"E	39.67'
W2-1080	S66°53'58"E	21.30'
W2-1081	N77°31'00"E	205.96'
W2-1082	N88°06'55"E	72.08'
W2-1083	S81°03'57"E	206.02'
W2-1084	S81°29'10"E	58.55'
W2-1085	S87°58'52"E	186.08'
W2-1086	S87°54'35"E	77.22'
W2-1087	S88°04'19"E	90.86'
W2-1088	S72°06'30"E	75.23'
W2-1089	S53°48'20"E	48.66'
W2-1090	S62°30'48"E	22.05'
W2-1091	S62°16'35"E	54.27'
W2-1092	S44°12'45"E	27.40'
W2-1093	S44°00'08"E	78.80'
W2-1094	S44°03'09"E	18.04'
W2-1095	S58°28'07"E	67.39'
W2-1096	S75°12'07"E	41.24'
W2-1097	N85°48'29"E	92.39'
W2-1098	N85°02'27"E	14.01'
W2-1099	N78°57'48"E	57.58'
W2-1100	N78°50'04"E	46.62'
W2-1101	N69°48'29"E	94.64'
W2-1102	N62°09'12"E	35.46'
W2-1103	N61°03'02"E	49.58'
W2-1104	N48°06'09"E	76.48'
W2-1105	N22°14'15"E	76.95'
W2-1106	N02°45'50"E	66.30'
W2-1107	N14°24'31"W	60.05'
W2-1108	N02°16'16"E	92.14'
W2-1109	N27°54'21"E	35.93'
W2-1110	N49°52'32"E	60.89'
W2-1111	N65°50'41"E	77.93'
W2-1112	N65°47'38"E	114.53'
W2-1113	N74°28'07"E	62.68'
W2-1114	N89°42'02"E	79.84'
W2-1115	S78°51'25"E	124.13'
W2-1116	S72°19'19"E	181.49'
W2-1117	N88°58'30"E	164.39'
W2-1118	S79°38'50"E	147.96'
W2-1119	S70°53'10"E	71.46'
W2-1120	S57°44'51"E	114.41'

W-2 LINE TABLE		
LINE	BEARING	DISTANCE
W2-1121	S70°52'28"E	49.17'
W2-1122	S67°06'37"E	286.21'
W2-1123	S53°23'34"E	78.18'
W2-1124	S65°56'03"W	116.00'
W2-1125	S40°46'22"E	28.32'
W2-1126	S41°11'48"E	39.32'
W2-1127	S32°24'38"E	12.65'
W2-1128	S32°12'48"E	36.56'
W2-1129	S32°12'47"E	12.19'
W2-1130	S32°59'48"E	11.42'
W2-1131	S32°06'34"E	33.47'
W2-1132	S32°48'11"E	10.96'
W2-1133	S33°13'57"E	18.06'
W2-1134	S31°43'52"E	13.42'
W2-1135	S37°53'16"E	39.30'
W2-1136	S37°33'26"E	32.59'
W2-1137	S37°33'25"E	30.73'
W2-1138	S26°38'40"E	14.39'
W2-1139	S27°18'16"E	15.30'
W2-1140	S26°59'04"E	16.08'
W2-1141	S26°16'54"E	27.86'
W2-1142	S26°43'54"E	19.33'
W2-1143	S26°40'18"E	15.62'
W2-1144	S26°45'35"E	21.81'
W2-1145	S26°51'05"E	36.65'
W2-1146	S31°01'17"E	27.92'
W2-1147	S30°43'16"E	20.98'
W2-1148	S30°45'13"E	36.40'
W2-1149	S30°50'13"E	77.58'
W2-1150	S35°51'05"E	30.49'
W2-1151	S35°40'00"E	108.10'
W2-1152	S35°38'21"E	35.79'
W2-1153	S45°57'34"E	158.45'
W2-1154	S55°16'02"E	108.20'
W2-1155	S66°38'44"E	132.13'
W2-1156	S78°51'59"E	101.43'
W2-1157	S74°35'01"E	330.57'
W2-1158	S70°45'51"E	60.51'
W2-1159	S70°25'35"E	34.30'
W2-1160	S59°14'07"E	181.90'
W2-1161	S89°42'11"E	148.05'
W2-1162	N84°34'12"E	126.78'
W2-1163	N72°58'27"E	250.61'
W2-1164	N79°47'17"E	114.22'
W2-1165	S86°39'19"E	97.90'
W2-1166	S76°32'37"E	47.27'
W2-1167	S56°46'40"E	139.30'
W2-1168	S79°41'03"E	184.43'

RECORD OF SURVEY NO. ____

* * *

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

* * *

SCALE: NO SCALE FEBRUARY, 2020

BY: TOWILL Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1169	S70°26'30"E	82.37'
W2-1170	S47°01'04"E	107.78'
W2-1171	S22°30'09"E	69.88'
W2-1172	S30°12'13"E	65.56'
W2-1173	S38°27'12"E	43.85'
W2-1174	S78°41'41"E	179.09'
W2-1175	S83°37'16"E	6.80'
W2-1176	S83°37'19"E	71.70'
W2-1177	S83°37'15"E	92.35'
W2-1178	S74°10'21"E	86.78'
W2-1179	S56°34'10"E	52.28'
W2-1180	S38°05'01"E	275.81'
W2-1181	S13°53'05"E	14.69'
W2-1182	S67°14'46"E	6.88'
W2-1183	S20°10'13"E	27.33'
W2-1184	S34°10'17"E	107.34'
W2-1185	S37°43'43"E	79.81'
W2-1186	S59°14'12"E	64.54'
W2-1187	S72°53'25"E	49.85'
W2-1188	N86°16'47"E	22.14'
W2-1189	N84°03'13"E	30.12'
W2-1190	N46°37'59"E	116.12'
W2-1191	N06°41'16"E	161.00'
W2-1192	N06°47'25"E	20.13'
W2-1193	N25°32'17"E	44.03'
W2-1194	N25°36'16"E	18.82'
W2-1195	N25°56'13"E	9.64'
W2-1196	N25°04'16"E	36.29'
W2-1197	N26°00'49"E	49.42'
W2-1198	N20°30'22"E	3.48'
W2-1199	N44°00'32"E	23.40'
W2-1200	N44°55'36"E	12.13'
W2-1201	N43°51'57"E	36.27'
W2-1202	N42°45'28"E	12.20'
W2-1203	N44°31'27"E	47.21'
W2-1204	N43°58'00"E	135.85'
W2-1205	S89°00'25"E	5.22'
W2-1206	N87°31'51"E	42.17'
W2-1207	N87°07'03"E	32.29'
W2-1208	N87°44'38"E	166.88'
W2-1209	S59°47'30"E	55.21'
W2-1210	S65°54'16"E	141.06'
W2-1211	S49°54'48"E	105.09'
W2-1212	S88°22'08"E	32.80'
W2-1213	S59°50'11"E	205.44'
W2-1214	S88°26'38"E	74.31'
W2-1215	S88°26'15"E	73.44'
W2-1216	N66°31'56"E	271.70'
W2-1217	N80°12'11"E	83.63'
W2-1218	N62°24'20"E	168.92'
W2-1219	N46°29'48"E	97.67'
W2-1220	N46°44'24"E	41.74'
W2-1221	N28°06'49"E	73.23'
W2-1222	N08°51'14"E	65.79'
W2-1223	N08°21'33"E	40.75'
W2-1224	N04°59'15"W	114.22'
W2-1225	N12°16'10"W	43.02'
W2-1226	N12°33'29"W	16.10'
W2-1227	N01°15'27"W	51.74'
W2-1228	N25°02'28"W	483.43'
W2-1229	N25°22'02"W	30.07'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1230	N00°34'57"W	443.29'
W2-1231	N13°58'29"W	306.79'
W2-1232	N01°25'44"E	114.70'
W2-1233	N29°23'46"W	95.82'
W2-1234	N01°36'09"E	81.93'
W2-1235	N32°17'26"W	59.24'
W2-1236	N12°29'25"W	372.18'
W2-1237	N12°27'20"W	33.69'
W2-1238	N01°34'20"E	115.06'
W2-1239	N43°46'33"W	46.16'
W2-1240	N12°37'19"W	67.81'
W2-1241	N01°36'07"E	164.22'
W2-1242	N58°20'21"E	31.72'
W2-1243	N58°53'46"E	31.52'
W2-1244	N60°38'53"E	55.49'
W2-1245	N46°09'02"E	45.44'
W2-1246	N55°41'19"E	66.15'
W2-1247	N54°16'53"E	116.94'
W2-1248	N53°07'05"E	147.08'
W2-1249	N56°01'41"E	104.83'
W2-1250	N51°31'53"E	251.50'
W2-1251	N52°20'34"E	1157.24'
W2-1252	N52°40'31"E	361.76'
W2-1253	N57°49'44"E	33.28'
W2-1254	N66°59'08"E	83.24'
W2-1255	N68°05'17"E	154.38'
W2-1256	N74°08'57"E	95.52'
W2-1257	N36°36'23"E	35.38'
W2-1258	N35°50'05"E	35.05'
W2-1259	N36°03'57"E	37.37'
W2-1260	N35°44'51"E	37.67'
W2-1261	N35°57'33"E	134.19'
W2-1262	N86°03'42"E	122.93'
W2-1263	N51°05'11"E	778.19'
W2-1264	S40°53'45"E	3.91'
W2-1265	S42°14'42"E	38.98'
W2-1266	S42°22'03"E	116.68'
W2-1267	S42°18'06"E	38.52'
W2-1268	S42°18'08"E	352.15'
W2-1269	S52°44'28"E	38.16'
W2-1270	S70°47'07"E	97.78'
W2-1271	S88°05'21"E	90.27'
W2-1272	S88°16'17"E	673.95'
W2-1273	S88°17'06"E	3581.93'
W2-1274	S72°03'08"E	44.91'
W2-1275	S04°46'34"W	13.14'
W2-1276	S04°58'56"W	1433.71'
W2-1277	S01°22'24"E	84.91'
W2-1278	N38°23'45"E	1460.62'
W2-1279	N38°23'02"E	4382.31'
W2-1280	N38°21'57"E	1460.64'
W2-1281	S50°40'19"E	897.05'
W2-1282	S50°40'14"E	2443.92'
W2-1283	N40°56'02"W	44.37'
W2-1284	S50°38'44"E	1284.85'
W2-1285	S46°53'11"E	50.41'
W2-1286	S50°44'13"E	5533.23'
W2-1287	S48°47'23"E	95.24'
W2-1288	S49°47'22"E	95.24'
W2-1289	S50°47'23"E	95.24'
W2-1290	S51°47'22"E	95.24'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1291	S53°02'25"E	142.97'
W2-1292	S53°19'25"E	64.36'
W2-1293	S54°19'26"E	64.36'
W2-1294	S55°19'26"E	64.36'
W2-1295	S56°19'25"E	64.36'
W2-1296	S57°26'46"E	74.09'
W2-1297	S65°02'06"E	118.23'
W2-1298	S80°44'28"E	141.09'
W2-1299	S80°57'33"E	131.93'
W2-1300	S89°03'05"E	389.81'
W2-1301	N84°17'39"E	229.39'
W2-1302	N84°11'27"E	63.12'
W2-1303	N65°54'28"E	49.78'
W2-1304	N64°54'29"E	63.23'
W2-1305	N63°54'29"E	63.23'
W2-1306	N62°54'28"E	63.23'
W2-1307	N61°40'52"E	91.91'
W2-1308	N63°02'29"E	45.92'
W2-1309	N62°02'29"E	45.92'
W2-1310	N61°02'29"E	45.92'
W2-1311	N60°02'28"E	45.92'
W2-1312	N59°02'29"E	45.92'
W2-1313	N58°02'31"E	45.92'
W2-1314	N57°02'29"E	45.92'
W2-1315	N56°02'29"E	45.92'
W2-1316	N55°02'28"E	17.56'
W2-1317	N01°37'35"E	26.55'
W2-1318	N56°06'13"E	1314.65'
W2-1319	N89°06'03"E	10.21'
W2-1320	N53°00'14"E	112.70'
W2-1321	N52°13'50"E	397.63'
W2-1322	N58°22'52"E	801.68'
W2-1323	N58°24'28"E	101.55'
W2-1324	N59°50'29"E	274.21'
W2-1325	N73°46'09"E	329.29'
W2-1326	N86°33'04"E	399.65'
W2-1327	N85°45'56"E	306.86'
W2-1328	N87°01'03"E	612.36'
W2-1329	N87°49'39"E	510.10'
W2-1330	N85°47'55"E	618.05'
W2-1331	N86°09'34"E	266.77'
W2-1332	N85°56'04"E	417.77'
W2-1333	S79°59'09"E	475.25'
W2-1334	S73°58'30"E	96.49'
W2-1335	S74°05'06"E	288.72'
W2-1336	S74°43'57"E	16.18'
W2-1337	S85°21'36"E	78.82'
W2-1338	S85°30'23"E	304.75'
W2-1339	N74°30'46"E	85.02'
W2-1340	N84°45'51"E	1359.45'
W2-1341	N84°45'19"E	3625.28'
W2-1342	N84°46'09"E	397.57'
W2-1343	N84°45'50"E	397.28'
W2-1344	N84°44'25"E	321.40'
W2-1345	N84°14'22"E	43.83'
W2-1346	N84°27'37"E	459.72'
W2-1347	N84°18'57"E	139.36'
W2-1348	S89°05'00"E	174.13'
W2-1349	N76°49'50"E	149.61'
W2-1350	S37°38'28"E	93.12'
W2-1351	S68°10'48"E	301.04'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1352	S52°52'37"E	428.38'
W2-1353	S42°29'18"E	564.30'
W2-1354	S39°44'37"E	136.31'
W2-1355	S68°42'02"E	1001.33'
W2-1356	S68°43'13"E	2868.14'
W2-1357	S68°30'37"E	48.68'
W2-1358	S85°03'40"E	274.38'
W2-1359	S85°29'15"E	173.62'
W2-1360	S85°30'36"E	989.64'
W2-1361	N68°08'32"E	71.58'
W2-1362	N04°22'08"E	126.09'
W2-1363	S84°14'53"E	100.03'
W2-1364	S84°14'36"E	313.28'
W2-1365	N76°06'55"E	773.69'
W2-1366	N77°12'37"E	686.17'
W2-1367	N59°56'30"E	139.44'
W2-1368	N60°10'38"E	12.83'
W2-1369	N69°17'01"E	315.31'
W2-1370	N70°43'19"E	344.15'
W2-1371	N77°35'55"E	535.03'
W2-1372	N85°30'34"E	416.36'
W2-1373	N60°15'08"E	9.38'
W2-1374	N68°18'10"E	9.35'
W2-1375	N68°23'14"E	9.37'
W2-1376	N76°34'33"E	388.53'
W2-1377	N76°35'20"E	36.50'
W2-1378	S87°57'05"E	209.56'
W2-1379	S81°09'28"E	224.01'
W2-1380	N85°30'34"E	123.34'
W2-1381	S75°32'38"E	15.52'
W2-1382	S75°54'34"E	488.00'
W2-1383	S70°22'31"E	531.73'
W2-1384	S69°05'47"E	95.76'
W2-1385	S69°12'32"E	62.04'
W2-1386	S62°01'02"E	105.92'
W2-1387	S72°50'15"E	59.21'
W2-1388	S67°13'56"E	293.02'
W2-1389	N89°26'46"E	780.07'
W2-1390	S03°28'03"E	167.41'
W2-1391	S78°51'52"W	212.76'
W2-1392	S84°55'32"E	134.82'
W2-1393	S84°55'34"E	428.35'
W2-1394	N85°01'34"E	137.83'
W2-1395	N74°03'05"E	59.29'
W2-1396	N74°02'38"E	136.29'
W2-1397	N60°43'51"E	199.54'
W2-1398	N60°43'25"E	87.76'
W2-1399	N55°16'43"E	77.04'
W2-1400	N51°16'47"E	91.26'
W2-1401	N47°17'00"E	91.26'
W2-1402	N44°40'41"E	27.25'
W2-1403	N42°05'27"E	91.26'
W2-1404	N38°05'14"E	91.26'
W2-1405	N34°05'26"E	91.26'
W2-1406	N30°05'02"E	91.27'
W2-1407	N26°04'59"E	91.26'
W2-1408	N28°13'47"E	5.13'
W2-1409	N25°52'37"E	37.23'
W2-1410	N21°52'06"E	37.23'
W2-1411	N17°53'29"E	37.24'
W2-1412	N13°52'07"E	37.24'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1413	N09°53'10"E	37.23'
W2-1414	N05°52'11"E	37.24'
W2-1415	N01°53'56"E	37.23'
W2-1416	N02°07'44"W	30.74'
W2-1417	N09°55'44"W	12.41'
W2-1418	N11°02'46"W	13.76'
W2-1419	N12°02'48"W	13.76'
W2-1420	N13°02'45"W	13.76'
W2-1421	N14°02'47"W	13.76'
W2-1422	N15°02'46"W	13.76'
W2-1423	N16°02'46"W	13.76'
W2-1424	N17°02'44"W	13.76'
W2-1425	N18°02'49"W	13.76'
W2-1426	N19°02'45"W	13.76'
W2-1427	N20°02'47"W	13.76'
W2-1428	N21°02'46"W	13.76'
W2-1429	N22°02'42"W	13.76'
W2-1430	N23°02'48"W	13.76'
W2-1431	N24°02'50"W	13.76'
W2-1432	N25°02'45"W	13.76'
W2-1433	N26°02'44"W	13.76'
W2-1434	N29°53'06"W	30.71'
W2-1435	N28°39'53"W	21.35'
W2-1436	N27°39'57"W	21.35'
W2-1437	N26°39'56"W	21.35'
W2-1438	N25°39'56"W	21.35'
W2-1439	N24°39'56"W	21.35'
W2-1440	N23°39'56"W	21.35'
W2-1441	N22°39'57"W	21.35'
W2-1442	N21°39'55"W	21.35'
W2-1443	N20°39'55"W	21.35'
W2-1444	N19°39'56"W	21.35'
W2-1445	N20°44'02"W	43.03'
W2-1446	N19°24'21"W	25.98'
W2-1447	N18°24'20"W	25.98'
W2-1448	N17°24'23"W	25.98'
W2-1449	N16°24'19"W	25.98'
W2-1450	N15°24'23"W	25.98'
W2-1451	N10°54'33"W	278.16'
W2-1452	N08°03'02"W	10.60'
W2-1453	N07°02'09"W	10.28'
W2-1454	N06°02'10"W	10.28'
W2-1455	N05°02'09"W	7.93'
W2-1456	N10°50'19"W	0.74'
W2-1457	N06°19'33"W	19.21'
W2-1458	N03°06'41"W	31.63'
W2-1459	N00°52'32"E	31.63'
W2-1460	N04°52'50"E	31.64'
W2-1461	N08°54'41"E	31.63'
W2-1462	N12°51'52"E	31.63'
W2-1463	N16°53'34"E	31.63'
W2-1464	N20°51'55"E	31.63'
W2-1465	N23°14'36"E	64.45'
W2-1466	N19°36'26"E	79.34'
W2-1467	N15°36'21"E	79.33'
W2-1468	N16°25'06"E	14.00'
W2-1469	N19°05'34"E	40.61'
W2-1470	N23°05'32"E	40.60'
W2-1471	N27°06'04"E	40.63'
W2-1472	N33°51'21"E	96.62'
W2-1473	N40°36'23"E	40.61'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1474	N44°37'02"E	40.60'
W2-1475	N48°37'07"E	40.62'
W2-1476	N52°37'45"E	40.61'
W2-1477	N50°31'23"E	0.18'
W2-1478	N54°59'11"E	21.81'
W2-1479	N58°59'46"E	[illegible]
W2-1480	N62°59'52"E	24.45'
W2-1481	N66°59'02"E	8.25'
W2-1482	N67°01'58"E	16.21'
W2-1483	N71°11'30"E	2.40'
W2-1484	N70°59'19"E	19.65'
W2-1485	N74°59'17"E	24.45'
W2-1486	N79°00'55"E	24.45'
W2-1487	N82°59'46"E	24.47'
W2-1488	N87°00'43"E	24.46'
W2-1489	S89°00'15"E	24.45'
W2-1490	S84°58'57"E	6.29'
W2-1491	S84°58'21"E	18.16'
W2-1492	S81°01'37"E	4.65'
W2-1493	S80°58'12"E	19.80'
W2-1494	S76°58'38"E	10.50'
W2-1495	S77°01'35"E	13.96'
W2-1496	S74°20'28"E	0.22'
W2-1497	S72°59'30"E	23.93'
W2-1498	S88°28'45"E	33.85'
W2-1499	S47°51'58"E	46.64'
W2-1500	S56°58'14"E	22.37'
W2-1501	S52°59'37"E	24.45'
W2-1502	S42°05'54"E	16.64'
W2-1503	S39°06'59"E	26.64'
W2-1504	S47°51'58"E	15.33'
W2-1505	S30°30'59"E	154.85'
W2-1506	S10°57'02"E	151.41'
W2-1507	S01°31'43"W	180.61'
W2-1508	S32°36'54"W	95.46'
W2-1509	S01°30'44"W	397.26'
W2-1510	S01°31'07"W	78.65'
W2-1511	S16°53'30"E	103.62'
W2-1512	S43°25'29"E	185.72'
W2-1513	S65°10'33"E	97.80'
W2-1514	S50°57'52"E	11.31'
W2-1515	S75°38'29"E	15.73'
W2-1516	S79°38'40"E	34.82'
W2-1517	S83°39'19"E	34.84'
W2-1518	S87°39'19"E	34.83'
W2-1519	N88°21'19"E	34.84'
W2-1520	N84°21'26"E	34.84'
W2-1521	N80°20'47"E	34.83'
W2-1522	N81°03'30"E	31.52'
W2-1523	N84°42'20"E	38.11'
W2-1524	N88°43'18"E	38.10'
W2-1525	S87°17'33"E	38.11'
W2-1526	S83°17'36"E	38.10'
W2-1527	S79°17'14"E	38.11'
W2-1528	S75°17'31"E	38.11'
W2-1529	S71°17'30"E	38.11'
W2-1530	S67°16'55"E	38.11'
W2-1531	S63°17'42"E	38.11'
W2-1532	S59°17'24"E	38.10'
W2-1533	S55°17'17"E	38.11'
W2-1534	S51°17'07"E	38.11'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1535	S47°17'11"E	38.11'
W2-1536	S43°17'55"E	38.11'
W2-1537	S39°16'34"E	38.11'
W2-1538	S35°17'56"E	38.12'
W2-1539	S31°17'03"E	38.10'
W2-1540	S27°17'26"E	33.26'
W2-1541	S27°18'50"E	4.85'
W2-1542	S23°17'41"E	9.08'
W2-1543	S23°17'16"E	14.92'
W2-1544	S23°11'52"E	7.04'
W2-1545	S22°02'37"E	2.18'
W2-1546	S22°01'56"E	8.44'
W2-1547	S19°16'11"E	16.34'
W2-1548	S30°18'45"E	9.87'
W2-1549	S07°58'44"E	10.17'
W2-1550	S15°17'30"E	36.66'
W2-1551	S11°16'57"E	27.64'
W2-1552	S08°54'31"E	25.94'
W2-1553	S03°17'57"E	23.55'
W2-1554	S19°21'07"E	213.36'
W2-1555	S19°19'00"E	131.13'
W2-1556	S43°28'18"E	211.32'
W2-1557	S43°25'06"E	113.45'
W2-1558	S70°04'32"E	103.78'
W2-1559	N76°32'02"E	61.71'
W2-1560	N76°45'33"E	110.43'
W2-1561	N76°36'46"E	110.81'
W2-1562	N77°31'45"E	22.07'
W2-1563	N76°39'37"E	420.97'
W2-1564	N83°37'11"E	132.54'
W2-1565	S62°17'43"E	209.78'
W2-1566	S55°55'16"E	136.32'
W2-1567	S04°48'41"E	32.20'
W2-1568	S04°17'25"E	51.55'
W2-1569	S04°10'58"E	32.90'
W2-1570	S04°35'06"E	9.14'
W2-1571	S22°36'33"W	209.31'
W2-1572	S22°36'32"W	32.14'
W2-1573	S22°22'19"W	32.48'
W2-1574	S08°16'28"E	34.67'
W2-1575	S05°16'10"E	94.85'
W2-1576	S19°16'47"E	88.43'
W2-1577	S40°43'03"E	85.69'
W2-1578	S49°04'50"E	79.24'
W2-1579	S67°39'54"E	165.70'
W2-1580	S80°02'32"E	65.20'
W2-1581	S87°34'44"E	11.02'
W2-1582	S88°28'01"E	203.32'
W2-1583	S88°55'33"E	195.49'
W2-1584	N79°12'00"E	57.17'
W2-1585	N54°20'17"W	85.52'
W2-1586	N54°14'57"W	57.31'
W2-1587	N54°07'01"W	57.76'
W2-1588	N54°17'27"W	45.26'
W2-1589	N83°33'26"W	90.11'
W2-1590	N70°17'22"E	219.51'
W2-1591	N87°48'30"E	170.04'
W2-1592	S78°45'55"E	44.55'
W2-1593	S78°59'05"E	136.51'
W2-1594	S38°12'09"E	125.23'
W2-1595	S00°52'34"W	84.11'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1596	S11°38'16"E	95.11'
W2-1597	S21°13'46"W	218.64'
W2-1598	S00°58'06"E	180.33'
W2-1599	S24°59'02"W	107.30'
W2-1600	S06°29'01"E	158.60'
W2-1601	S07°53'16"E	78.10'
W2-1602	S32°50'05"E	120.81'
W2-1603	S03°35'09"E	190.28'
W2-1604	S69°14'17"W	36.53'
W2-1605	S69°52'09"W	198.06'
W2-1606	S69°37'59"W	97.47'
W2-1607	S69°46'17"W	97.07'
W2-1608	S69°50'08"W	23.32'
W2-1609	S69°34'38"W	23.05'
W2-1610	S30°58'51"W	32.41'
W2-1611	S13°06'37"W	224.66'
W2-1612	S01°48'08"W	143.84'
W2-1613	S02°36'09"W	144.62'
W2-1614	S35°04'55"E	134.95'
W2-1615	N74°33'31"E	137.01'
W2-1616	N51°28'09"E	2.91'
W2-1617	N51°03'43"E	25.95'
W2-1618	N50°48'24"E	70.30'
W2-1619	N50°48'32"E	25.54'
W2-1620	N41°48'25"E	10.32'
W2-1621	N40°48'25"E	11.89'
W2-1622	N39°48'20"E	11.89'
W2-1623	N34°57'24"E	22.46'
W2-1624	N36°21'57"E	12.35'
W2-1625	N37°21'53"E	12.35'
W2-1626	N38°21'57"E	12.35'
W2-1627	N39°21'56"E	12.35'
W2-1628	N40°22'01"E	12.35'
W2-1629	N41°21'54"E	12.35'
W2-1630	N42°21'54"E	12.35'
W2-1631	N43°21'59"E	12.35'
W2-1632	N44°21'55"E	12.35'
W2-1633	N45°21'57"E	12.35'
W2-1634	N46°22'00"E	12.35'
W2-1635	N47°21'57"E	12.35'
W2-1636	N48°21'56"E	12.35'
W2-1637	N49°21'58"E	12.35'
W2-1638	N50°21'59"E	12.35'
W2-1639	N51°22'00"E	10.53'
W2-1640	N49°47'24"E	61.24'
W2-1641	N55°49'48"E	49.96'
W2-1642	N55°49'55"E	39.88'
W2-1643	N55°49'53"E	9.78'
W2-1644	N46°16'22"E	120.77'
W2-1645	N58°21'56"E	85.36'
W2-1646	N58°05'16"E	51.10'
W2-1647	N74°55'33"E	39.08'
W2-1648	N52°52'45"E	0.13'
W2-1649	N57°16'32"E	28.25'
W2-1650	N61°40'16"E	28.25'
W2-1651	N66°04'05"E	28.25'
W2-1652	N70°27'49"E	28.25'
W2-1653	N74°51'36"E	28.25'
W2-1654	N79°15'22"E	28.25'
W2-1655	N83°39'09"E	28.25'
W2-1656	N88°02'55"E	28.25'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1657	S82°38'34"E	22.51'
W2-1658	S76°48'26"E	15.73'
W2-1659	N49°13'53"E	38.07'
W2-1660	N49°17'35"E	47.73'
W2-1661	N49°11'53"E	48.19'
W2-1662	N49°23'59"E	74.77'
W2-1663	N48°58'45"E	64.34'
W2-1664	S61°14'36"E	48.27'
W2-1665	S73°36'20"E	39.46'
W2-1666	S63°52'51"E	45.25'
W2-1667	S54°51'36"E	81.48'
W2-1668	S42°01'47"E	98.92'
W2-1669	S19°02'40"E	85.20'
W2-1670	S11°04'25"E	60.29'
W2-1671	S01°24'30"W	62.26'
W2-1672	S11°04'42"W	34.41'
W2-1673	S16°18'03"W	58.92'
W2-1674	S23°24'10"W	48.48'
W2-1675	S23°39'18"W	125.19'
W2-1676	S23°38'10"W	52.52'
W2-1677	S23°28'59"W	52.85'
W2-1678	S23°49'40"W	25.31'
W2-1679	S23°53'59"E	7.62'
W2-1680	S22°18'11"E	14.19'
W2-1681	S68°40'01"E	70.58'
W2-1682	S67°55'53"E	129.58'
W2-1683	N57°37'30"E	51.96'
W2-1684	N64°52'08"E	11.63'
W2-1685	N64°43'48"E	22.31'
W2-1686	N63°24'49"E	22.90'
W2-1687	S83°52'56"E	11.95'
W2-1688	S85°42'31"E	30.53'
W2-1689	S32°45'11"E	79.15'
W2-1690	S32°20'38"E	12.19'
W2-1691	S35°03'41"E	4.95'
W2-1692	S35°25'50"E	69.13'
W2-1693	S20°07'29"E	10.53'
W2-1694	S19°12'39"E	1.15'
W2-1695	S66°27'38"E	58.05'
W2-1696	S65°43'30"E	147.16'
W2-1697	S64°59'23"E	147.16'
W2-1698	N73°36'51"E	71.99'
W2-1699	N71°39'57"E	71.99'
W2-1700	N69°43'02"E	71.99'
W2-1701	N67°46'06"E	71.99'
W2-1702	N65°49'11"E	71.99'
W2-1703	N63°52'18"E	71.99'
W2-1704	N61°55'21"E	71.99'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1705	N59°58'27"E	71.99'
W2-1706	N58°01'32"E	71.99'
W2-1707	N56°04'37"E	71.99'
W2-1708	N54°07'42"E	71.99'
W2-1709	N52°10'48"E	71.99'
W2-1710	N50°13'53"E	71.99'
W2-1711	S05°32'35"E	38.32'
W2-1712	N57°03'01"E	64.58'
W2-1713	N56°48'20"E	430.98'
W2-1714	N56°47'56"E	720.79'
W2-1715	N57°38'24"E	31.23'
W2-1716	N56°51'52"E	551.45'
W2-1717	N57°36'48"E	30.54'
W2-1718	N59°23'21"E	57.18'
W2-1719	N58°54'38"E	252.47'
W2-1720	N60°28'36"E	186.41'
W2-1721	N61°32'38"E	156.13'
W2-1722	N57°18'35"E	157.43'
W2-1723	N60°39'36"E	163.56'
W2-1724	N58°46'06"E	169.25'
W2-1725	N58°18'21"E	152.90'
W2-1726	N56°16'42"E	99.42'
W2-1727	N60°12'52"E	177.12'
W2-1728	N59°27'38"E	216.62'
W2-1729	N60°32'14"E	379.30'
W2-1730	N24°26'54"W	302.08'
W2-1731	N67°38'45"E	685.31'
W2-1732	N57°59'22"E	11.40'
W2-1733	N84°36'26"E	60.15'
W2-1734	N84°15'26"E	56.97'
W2-1735	N85°00'54"E	42.89'
W2-1736	N67°40'47"E	144.29'
W2-1737	N70°54'10"E	11.73'
W2-1738	N63°33'22"E	158.74'
W2-1739	N76°34'24"E	39.83'
W2-1740	N63°12'19"E	25.89'
W2-1741	S17°35'56"E	44.91'
W2-1742	S17°33'46"E	25.71'
W2-1743	N70°14'15"E	6.20'
W2-1744	N68°46'15"E	21.30'
W2-1745	N68°41'58"E	48.26'
W2-1746	N07°01'49"W	16.91'
W2-1747	N07°31'03"W	33.86'
W2-1748	N06°26'53"W	31.94'
W2-1749	N64°05'42"E	31.53'
W2-1750	N57°36'19"E	61.08'
W2-1751	N75°01'33"E	34.69'
W2-1752	N74°03'25"E	16.37'

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: TOWILL Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 11 OF 21

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1753	N74°54'21"E	88.75'
W2-1754	N71°38'56"E	5.53'
W2-1755	N72°01'21"E	108.25'
W2-1756	N64°40'01"E	155.90'
W2-1757	N64°20'08"E	90.50'
W2-1758	N79°34'25"E	13.02'
W2-1759	N77°23'46"E	39.09'
W2-1760	N77°43'22"E	12.82'
W2-1761	N75°04'26"E	21.41'
W2-1762	N74°13'45"E	63.61'
W2-1763	N73°54'55"E	21.24'
W2-1764	N73°20'18"E	45.96'
W2-1765	N72°54'10"E	36.61'
W2-1766	N71°20'17"E	14.16'
W2-1767	N76°46'28"E	4.49'
W2-1768	N73°03'59"E	13.11'
W2-1769	N73°48'16"E	69.52'
W2-1770	N73°13'42"E	45.68'
W2-1771	N73°58'07"E	47.62'
W2-1772	N73°32'04"E	56.24'
W2-1773	N78°00'36"E	72.04'
W2-1774	S89°08'28"E	13.35'
W2-1775	S89°08'27"E	46.44'
W2-1776	S81°27'30"E	27.24'
W2-1777	S81°34'01"E	63.53'
W2-1778	N88°30'14"E	17.72'
W2-1779	N86°57'29"E	26.76'
W2-1780	N87°37'56"E	6.37'
W2-1781	N87°37'56"E	19.50'
W2-1782	N71°08'19"E	60.43'
W2-1783	N70°49'55"E	45.72'
W2-1784	N70°32'16"E	51.38'
W2-1785	N76°48'01"E	148.40'
W2-1786	N73°48'33"E	13.66'
W2-1787	N73°31'12"E	65.98'
W2-1788	N61°33'19"E	25.29'
W2-1789	N61°39'33"E	73.14'
W2-1790	N57°59'25"E	80.51'
W2-1791	N56°14'22"E	140.36'
W2-1792	N65°34'22"E	79.28'
W2-1793	N58°45'28"E	82.22'
W2-1794	N72°22'27"E	88.44'
W2-1795	N79°44'06"E	103.82'
W2-1796	N73°12'34"E	85.28'
W2-1797	N44°37'37"E	54.96'
W2-1798	N32°24'47"E	255.09'
W2-1799	N29°41'53"E	45.72'
W2-1800	N58°13'20"E	33.08'
W2-1801	N69°35'46"E	49.20'
W2-1802	N51°58'08"E	5.22'
W2-1803	N53°38'16"E	67.42'
W2-1804	N60°35'50"E	67.20'
W2-1805	N79°27'07"E	92.08'
W2-1806	N86°26'48"E	104.21'
W2-1807	N78°49'43"E	47.18'
W2-1808	N71°54'03"E	54.93'
W2-1809	N53°49'05"E	50.17'
W2-1810	N62°46'53"E	68.09'
W2-1811	N83°48'13"E	62.29'
W2-1812	N77°06'28"E	59.76'
W2-1813	N73°05'35"E	71.61'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1814	N76°47'20"E	197.76'
W2-1815	N83°34'12"E	109.13'
W2-1816	N82°28'59"E	95.04'
W2-1817	N85°38'44"E	68.19'
W2-1818	N82°06'13"E	78.99'
W2-1819	N88°55'18"E	54.01'
W2-1820	S87°01'20"E	108.04'
W2-1821	N87°59'25"E	80.20'
W2-1822	N80°50'25"E	138.22'
W2-1823	S02°11'02"W	1324.21'
W2-1824	S11°21'41"W	708.04'
W2-1825	S07°38'58"E	606.11'
W2-1826	S34°24'19"E	1806.22'
W2-1827	S42°39'37"E	543.89'
W2-1828	S33°18'13"E	1705.18'
W2-1829	S49°21'03"E	1944.17'
W2-1830	S41°46'27"E	694.57'
W2-1831	S34°04'20"E	924.[illegible]'
W2-1832	S53°11'11"E	293.26'
W2-1833	S33°49'08"W	174.40'
W2-1834	S13°20'46"W	568.42'
W2-1835	S13°12'08"E	707.53'
W2-1836	S39°31'33"E	412.20'
W2-1837	S73°27'14"E	465.18'
W2-1838	S55°13'22"E	229.71'
W2-1839	S30°49'23"E	260.15'
W2-1840	S60°46'36"E	407.40'
W2-1841	S21°09'44"E	661.00'
W2-1842	S41°26'28"E	526.46'
W2-1843	S66°09'26"E	819.49'
W2-1844	S14°42'08"E	1746.47'
W2-1845	S09°21'56"E	635.60'
W2-1846	S31°23'16"E	201.35'
W2-1847	S14°17'08"W	369.68'
W2-1848	S13°32'01"E	1236.37'
W2-1849	S47°39'35"E	454.39'
W2-1850	S74°10'34"E	218.67'
W2-1851	S09°48'42"E	103.19'
W2-1852	S29°56'36"E	388.15'
W2-1853	S57°57'12"E	1169.22'
W2-1854	S89°50'21"E	259.01'
W2-1855	S18°07'04"E	831.98'
W2-1856	S39°49'50"E	485.50'
W2-1857	S27°44'19"E	598.28'
W2-1858	S10°49'39"E	587.82'
W2-1859	S30°55'23"E	713.78'
W2-1860	S40°10'36"E	594.17'
W2-1861	S59°49'19"E	769.02'
W2-1862	S44°22'37"E	392.87'
W2-1863	S65°57'13"E	241.05'
W2-1864	S25°05'28"W	157.86'
W2-1865	S00°25'48"W	273.79'
W2-1866	S27°26'41"E	407.68'
W2-1867	S08°39'31"W	266.36'
W2-1868	S15°17'26"E	249.68'
W2-1869	S25°31'41"W	327.50'
W2-1870	S01°08'15"W	727.70'
W2-1871	S24°57'30"E	607.34'
W2-1872	S43°52'03"E	674.59'
W2-1873	S67°32'36"E	561.23'
W2-1874	S17°05'06"E	322.43'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1875	S34°04'07"E	357.34'
W2-1876	S61°24'28"E	925.82'
W2-1877	S37°49'49"E	480.05'
W2-1878	S73°00'53"E	714.96'
W2-1879	S52°00'43"E	253.42'
W2-1880	S78°31'20"E	292.88'
W2-1881	N70°01'05"E	715.21'
W2-1882	N26°21'44"E	311.75'
W2-1883	N56°34'23"E	382.32'
W2-1884	S12°32'11"W	235.75'
W2-1885	S11°38'59"E	412.99'
W2-1886	S43°16'12"E	352.76'
W2-1887	S20°10'16"E	608.01'
W2-1888	S34°01'24"E	474.47'
W2-1889	S53°29'16"E	555.48'
W2-1890	S40°37'25"E	903.90'
W2-1891	S64°03'03"E	823.86'
W2-18[illegible]	S0[illegible]"E	1851.78'
W2-1893	S05°57'11"W	1016.39'
W2-1894	S27°48'36"W	362.71'
W2-1895	S14°30'18"E	408.05'
W2-1896	S00°36'03"E	417.35'
W2-1897	S21°31'36"E	511.76'
W2-1898	S43°18'04"E	243.41'
W2-1899	S65°04'32"E	810.36'
W2-1900	S18°17'27"E	1451.69'
W2-1901	S24°09'01"W	290.17'
W2-1902	S05°19'06"W	539.35'
W2-1903	S07°12'36"E	1908.57'
W2-1904	S17°51'47"E	365.66'
W2-1905	S36°16'12"E	1088.43'
W2-1906	S53°06'08"E	1576.16'
W2-1907	S74°39'09"E	3203.25'
W2-1908	S88°17'42"E	784.09'
W2-1909	N72°23'40"E	381.18'
W2-1910	S47°48'33"E	213.82'
W2-1911	S24°54'24"W	801.93'
W2-1912	S02°58'43"E	545.70'
W2-1913	S46°25'35"E	579.19'
W2-1914	S31°45'05"E	362.93'
W2-1915	S08°35'04"W	120.99'
W2-1916	S44°51'32"W	470.72'
W2-1917	S01°36'15"E	558.19'
W2-1918	S35°28'55"W	739.84'
W2-1919	S06°41'40"W	450.85'
W2-1920	S62°15'24"W	556.38'
W2-1921	S24°57'56"W	329.27'
W2-1922	S01°33'31"E	400.61'
W2-1923	S23°16'01"E	990.73'
W2-1924	S23°16'01"E	81.58'
W2-1925	N75°41'26"E	1045.88'
W2-1926	S67°34'17"W	394.86'
W2-1927	S54°04'10"E	735.22'
W2-1928	S19°02'02"W	335.38'
W2-1929	S31°16'51"E	636.69'
W2-1930	S54°36'22"E	485.25'
W2-1931	S79°44'38"E	587.66'
W2-1932	N48°11'10"E	246.23'
W2-1933	N08°58'23"E	342.87'
W2-1934	N20°14'45"W	439.60'
W2-1935	N63°07'27"E	253.16'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1936	N38°17'48"E	286.06'
W2-1937	N88°41'48"E	248.48'
W2-1938	S21°48'21"E	423.16'
W2-1939	S52°52'01"E	653.33'
W2-1940	N88°33'53"E	532.72'
W2-1941	S59°26'40"E	560.52'
W2-1942	N87°34'47"E	543.52'
W2-1943	N36°48'24"E	328.85'
W2-1944	S47°25'04"E	680.88'
W2-1945	S52°44'01"E	430.01'
W2-1946	S75°56'55"E	174.85'
W2-1947	S75°56'44"E	218.46'
W2-1948	N78°40'09"E	352.74'
W2-1949	S62°06'13"E	580.36'
W2-1950	S04°53'32"W	512.42'
W2-1951	S14°54'00"E	222.18'
W2-1952	S34°41'31"E	255.21'
W2-1953	S34°41'31"E	133.88'
W2-1954	S05°43'21"E	204.69'
W2-1955	S23°53'21"E	204.58'
W2-1956	S42°03'21"E	275.57'
W2-1957	S06°05'40"E	257.07'
W2-1958	S36°43'28"E	253.31'
W2-1959	S32°53'55"W	454.48'
W2-1960	S14°25'26"E	501.54'
W2-1961	S39°14'45"E	425.35'
W2-1962	S71°21'02"E	344.95'
W2-1963	N84°18'10"E	348.99'
W2-1964	S24°24'09"E	1029.64'
W2-1965	S80°14'25"W	373.13'
W2-1966	S23°58'32"W	325.00'
W2-1967	S29°45'59"E	552.23'
W2-1968	S60°28'52"E	717.73'
W2-1969	N83°28'02"E	353.15'
W2-1970	S24°46'39"E	54.80'
W2-1971	N70°41'41"E	141.92'
W2-1972	S17°10'44"E	260.08'
W2-1973	S30°09'21"E	147.66'
W2-1974	S51°23'29"E	1076.97'
W2-1975	S66°25'45"E	343.18'
W2-1976	S86°24'00"E	298.38'
W2-1977	S51°07'55"E	136.75'
W2-1978	S17°39'24"W	99.56'
W2-1979	S01°32'40"W	268.18'
W2-1980	S17°32'22"E	566.23'
W2-1981	S07°23'34"E	476.33'
W2-1982	S26°56'58"E	176.45'
W2-1983	S51°02'20"E	503.76'
W2-1984	S70°05'33"E	524.34'
W2-1985	S28°38'51"E	234.79'
W2-1986	S06°46'32"E	243.31'
W2-1987	S36°09'37"E	274.41'
W2-1988	S27°02'54"W	307.15'
W2-1989	S02°18'45"E	262.34'
W2-1990	S41°57'29"E	475.04'
W2-1991	S37°35'42"W	244.61'
W2-1992	N83°32'07"W	498.81'
W2-1993	S73°30'30"W	931.65'
W2-1994	S62°51'16"W	849.07'
W2-1995	S84°22'08"W	375.57'
W2-1996	N64°56'07"E	261.97'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-1997	N39°20'17"E	186.16'
W2-1998	N22°51'24"E	368.14'
W2-1999	N09°32'20"E	151.15'
W2-2000	N19°33'47"W	178.49'
W2-2001	N42°49'10"W	363.48'
W2-2002	N66°29'06"W	301.97'
W2-2003	N51°54'04"W	493.58'
W2-2004	N77°28'32"W	283.26'
W2-2005	S76°57'00"W	272.69'
W2-2006	N49°08'19"W	209.01'
W2-2007	N75°20'10"W	300.66'
W2-2008	S64°13'36"W	333.89'
W2-2009	S38°52'54"W	287.80'
W2-2010	N85°07'21"W	231.59'
W2-2011	S75°09'34"W	1010.45'
W2-2012	S53°39'03"W	227.42'
W2-2013	S13°46'44"W	220.03'
W2-2014	S30°49'50"E	277.48'
W2-2015	S55°50'50"E	2851.23'
W2-2016	S51°34'28"E	1224.88'
W2-2017	S67°48'40"E	184.77'
W2-2018	S84°09'57"E	580.04'
W2-2019	S71°59'11"E	436.37'
W2-2020	N73°53'49"E	216.45'
W2-2021	S21°50'30"E	311.87'
W2-2022	S67°44'09"E	836.04'
W2-2023	S74°01'50"E	1073.14'
W2-2024	N88°36'48"E	569.94'
W2-2025	N65°56'26"E	319.04'
W2-2026	S82°41'30"E	186.64'
W2-2027	N80°45'57"E	172.19'
W2-2028	S69°30'01"E	413.47'
W2-2029	S45°32'10"E	385.57'
W2-2030	S02°17'03"E	170.16'
W2-2031	S31°09'11"W	366.59'
W2-2032	S00°07'06"E	376.32'
W2-2033	S31°33'51"E	277.21'
W2-2034	S64°47'45"W	214.46'
W2-2035	S87°54'53"W	384.91'
W2-2036	S51°06'08"W	264.15'
W2-2037	S06°51'32"W	229.84'
W2-2038	S26°53'51"E	405.70'
W2-2039	S29°29'06"E	50.42'
W2-2040	S24°30'19"E	54.53'
W2-2041	S26°53'51"E	70.66'
W2-2042	S14°33'50"E	161.44'
W2-2043	S05°28'12"E	41.71'
W2-2044	S32°06'34"W	185.67'
W2-2045	S52°42'07"W	46.48'
W2-2046	S51°43'05"W	35.90'
W2-2047	S52°53'42"W	72.37'
W2-2048	S52°58'32"W	77.93'
W2-2049	S20°42'49"W	249.91'
W2-2050	S23°52'45"W	14.67'
W2-2051	S20°53'21"W	68.22'
W2-2052	S16°55'35"W	45.52'
W2-2053	S22°10'02"W	141.05'
W2-2054	S20°53'21"W	415.26'
W2-2055	S03°01'04"E	991.87'
W2-2056	S31°49'54"E	856.27'
W2-2057	S12°16'11"E	453.92'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-2058	S17°14'17"W	352.95'
W2-2059	S49°05'36"W	1311.61'
W2-2060	S28°44'34"W	227.90'
W2-2061	N81°46'39"W	290.16'
W2-2062	N52°54'34"W	368.40'
W2-2063	N81°09'04"W	477.62'
W2-2064	N24°14'23"W	502.63'
W2-2065	N51°47'02"E	461.31'
W2-2066	N02°57'11"E	328.70'
W2-2067	N53°33'19"W	421.32'
W2-2068	N35°20'51"W	637.17'
W2-2069	N57°33'56"W	662.43'
W2-2070	N19°01'41"W	355.29'
W2-2071	N44°48'23"W	453.82'
W2-2072	N28°43'07"W	1032.39'
W2-2073	N45°09'26"W	905.93'
W2-2074	N36°56'49"W	1167.40'
W2-2075	N50°28'15"W	2680.72'
W2-2076	N64°16'52"W	1379.58'
W2-2077	N86°51'29"W	536.84'
W2-2078	S49°46'31"W	352.46'
W2-2079	N58°29'31"W	74.44'
W2-2080	N20°47'41"W	810.20'
W2-2081	N50°17'34"W	3907.27'
W2-2082	S84°22'25"W	227.78'
W2-2083	N37°30'00"W	468.43'
W2-2084	N61°50'57"W	1650.17'
W2-2085	S74°52'59"W	280.17'
W2-2086	N62°35'19"W	605.52'
W2-2087	N84°34'55"W	509.52'
W2-2088	N37°12'29"W	867.14'
W2-2089	N55°24'20"W	209.91'
W2-2090	S85°17'57"W	543.54'
W2-2091	N62°05'32"W	355.41'
W2-2092	S78°08'02"W	330.29'
W2-2093	S44°38'50"W	370.58'
W2-2094	S02°08'52"W	608.05'
W2-2095	S24°38'34"E	474.37'
W2-2096	S16°45'21"W	706.33'
W2-2097	S13°49'02"E	583.79'
W2-2098	S40°47'08"E	353.37'
W2-2099	S62°17'14"E	847.58'
W2-2100	S46°15'39"E	1606.31'
W2-2101	N65°57'55"W	466.97'
W2-2102	N87°03'47"W	559.63'
W2-2103	N65°04'35"W	647.17'
W2-2104	S71°25'16"W	1339.80'
W2-2105	S33°39'31"W	627.34'
W2-2106	N74°42'48"W	195.94'
W2-2107	N89°21'16"W	1107.69'
W2-2108	N66°06'13"W	862.17'
W2-2109	S88°13'24"W	205.66'
W2-2110	S49°51'18"W	522.04'
W2-2111	S03°17'58"W	272.61'
W2-2112	S37°10'19"E	1407.29'
W2-2113	S40°21'42"W	243.53'
W2-2114	S12°23'03"W	367.36'
W2-2115	S09°30'02"E	155.52'
W2-2116	S31°44'34"E	967.13'
W2-2117	S02°25'05"W	667.43'
W2-2118	N67°04'25"W	400.79'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-2119	S76°36'34"W	231.37'
W2-2120	S49°46'42"W	231.86'
W2-2121	S09°49'39"W	328.12'
W2-2122	S12°24'15"E	193.17'
W2-2123	S45°35'30"E	543.07'
W2-2124	S34°05'43"E	1173.84'
W2-2125	S65°05'16"E	903.54'
W2-2126	S28°57'37"E	344.41'
W2-2127	S40°16'15"E	897.41'
W2-2128	S65°34'29"E	459.88'
W2-2129	S38°07'00"E	275.45'
W2-2130	S87°47'08"W	314.39'
W2-2131	S68°49'09"W	384.92'
W2-2132	N26°46'05"W	777.38'
W2-2133	N56°07'49"W	563.56'
W2-2134	S87°52'02"W	501.49'
W2-2135	S70°44'50"W	449.64'
W2-2136	N85°55'11"W	264.51'
W2-2137	S52°12'28"W	771.59'
W2-2138	S83°09'43"W	276.10'
W2-2139	N63°09'43"W	277.10'
W2-2140	N83°19'32"W	365.53'
W2-2141	S76°58'51"W	221.12'
W2-2142	S57°17'15"W	288.08'
W2-2143	N69°11'50"W	199.84'
W2-2144	N76°07'54"W	626.45'
W2-2145	S87°07'46"W	230.36'
W2-2146	N36°18'20"W	264.91'
W2-2147	N54°25'40"W	262.97'
W2-2148	N64°34'50"W	595.77'
W2-2149	S71°27'40"W	222.91'
W2-2150	S55°39'01"W	431.85'
W2-2151	N77°52'49"W	1766.13'
W2-2152	S76°34'37"W	282.93'
W2-2153	S25°44'47"W	447.92'
W2-2154	S12°43'22"E	219.98'
W2-2155	S46°29'27"E	365.86'
W2-2156	S26°13'22"E	66.91'
W2-2157	S13°15'35"W	422.71'
W2-2158	S02°58'58"E	183.53'
W2-2159	S25°33'03"E	322.39'
W2-2160	S65°52'35"E	221.66'
W2-2161	N76°44'44"E	378.67'
W2-2162	N47°30'05"E	286.74'
W2-2163	S50°22'24"E	316.62'
W2-2164	S86°01'55"E	425.63'
W2-2165	S54°42'27"E	211.13'
W2-2166	S22°20'45"W	144.31'
W2-2167	S07°51'21"E	197.28'
W2-2168	S42°17'38"E	527.08'
W2-2169	S71°23'07"E	299.70'
W2-2170	N77°57'19"E	277.69'
W2-2171	N47°20'51"E	176.59'
W2-2172	S73°23'31"E	420.81'
W2-2173	S67°48'23"E	419.65'
W2-2174	S80°15'37"E	779.03'
W2-2175	S00°03'07"E	206.05'
W2-2176	S33°25'21"E	203.28'
W2-2177	S70°13'28"E	841.36'
W2-2178	S81°50'59"E	1075.97'
W2-2179	N65°17'09"E	308.06'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-2180	N88°18'53"E	492.75'
W2-2181	N51°01'42"E	370.15'
W2-2182	N77°22'40"E	347.12'
W2-2183	N38°32'38"E	245.54'
W2-2184	N09°47'42"E	250.69'
W2-2185	N89°30'17"E	215.31'
W2-2186	S62°33'46"E	451.54'
W2-2187	S77°54'35"E	173.66'
W2-2188	N72°29'53"E	273.58'
W2-2189	S72°58'51"E	510.68'
W2-2190	S59°25'57"E	405.18'
W2-2191	N70°56'14"E	425.81'
W2-2192	N26°02'25"E	269.26'
W2-2193	N24°06'30"W	560.34'
W2-2194	N08°15'41"E	461.86'
W2-2195	N19°49'17"W	492.09'
W2-2196	S71°20'25"E	1165.11'
W2-2197	S44°08'04"E	1565.04'
W2-2198	S56°54'12"E	145.03'
W2-2199	S82°59'46"E	151.22'
W2-2200	S32°55'32"E	220.84'
W2-2201	N62°26'55"W	512.97'
W2-2202	N83°47'15"W	1203.22'
W2-2203	S66°56'23"W	475.12'
W2-2204	S35°54'57"W	262.86'
W2-2205	S09°13'41"E	455.07'
W2-2206	S40°31'15"E	300.34'
W2-2207	S87°29'59"E	403.74'
W2-2208	S68°59'43"E	211.04'
W2-2209	S47°17'14"E	898.25'
W2-2210	N87°15'33"E	340.37'
W2-2211	S16°57'59"E	592.56'
W2-2212	S49°33'23"E	573.01'
W2-2213	S63°04'39"E	2405.15'
W2-2214	S41°36'51"E	1268.87'
W2-2215	S42°50'03"E	611.07'
W2-2216	S72°50'39"E	648.88'
W2-2217	S51°16'00"E	1076.53'
W2-2218	S28°59'05"W	161.00'
W2-2219	S69°31'25"W	310.30'
W2-2220	N47°08'29"W	682.26'
W2-2221	N79°25'05"W	223.74'
W2-2222	S57°57'36"W	525.84'
W2-2223	S11°58'17"W	283.58'
W2-2224	S33°02'57"E	392.96'
W2-2225	S00°18'34"W	285.17'
W2-2226	S39°52'06"E	785.03'
W2-2227	S55°39'55"E	921.51'
W2-2228	S72°39'36"E	185.98'
W2-2229	S24°04'42"E	184.01'
W2-2230	S40°23'21"E	1069.62'
W2-2231	S26°41'33"E	398.71'
W2-2232	S12°46'40"E	902.07'
W2-2233	S34°13'09"E	1393.26'
W2-2234	S63°10'49"E	542.72'
W2-2235	S47°43'15"E	614.40'
W2-2236	S79°45'33"E	261.04'
W2-2237	S09°25'48"E	101.34'
W2-2238	S35°36'54"E	195.13'
W2-2239	S52°54'56"E	804.41'
W2-2240	S43°12'45"E	258.48'

W-2 LINE TABLE

LINE	BEARING	DISTANCE
W2-2241	S24°36'06"E	522.87'
W2-2242	S54°36'48"E	600.23'
W2-2243	S45°44'01"E	546.84'
W2-2244	S70°57'32"E	515.56'
W2-2245	S60°37'18"E	723.14'
W2-2246	N83°06'12"E	453.94'
W2-2247	S05°19'40"E	149.33'
W2-2248	S27°38'02"E	418.98'
W2-2249	N47°45'51"E	0.92'
W2-2250	S44°19'07"E	77.07'
W2-2251	S54°53'58"W	1256.28'

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-2

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

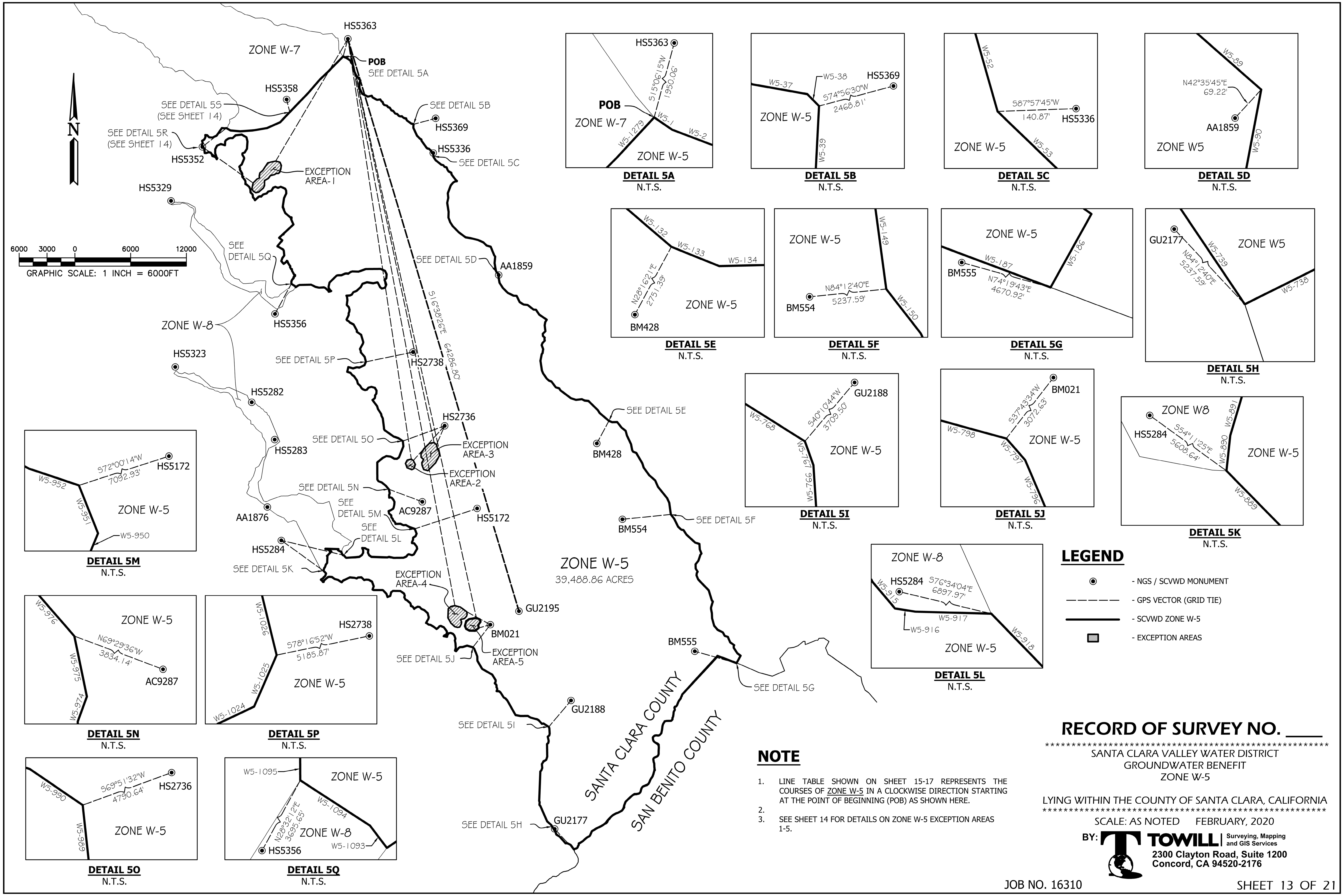
****

SCALE: NO SCALE FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 12 OF 21



LEGEND

◉	- NGS / SCVWD MONUMENT
— — — —	- GPS VECTOR (GRID TIE)
▬▬▬	- SCVWD ZONE W-5
▨	- EXCEPTION AREAS

NOTE

1. LINE TABLE SHOWN ON SHEET 15-17 REPRESENTS THE COURSES OF ZONE W-5 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN HERE.
2.
3. SEE SHEET 14 FOR DETAILS ON ZONE W-5 EXCEPTION AREAS 1-5.

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-5

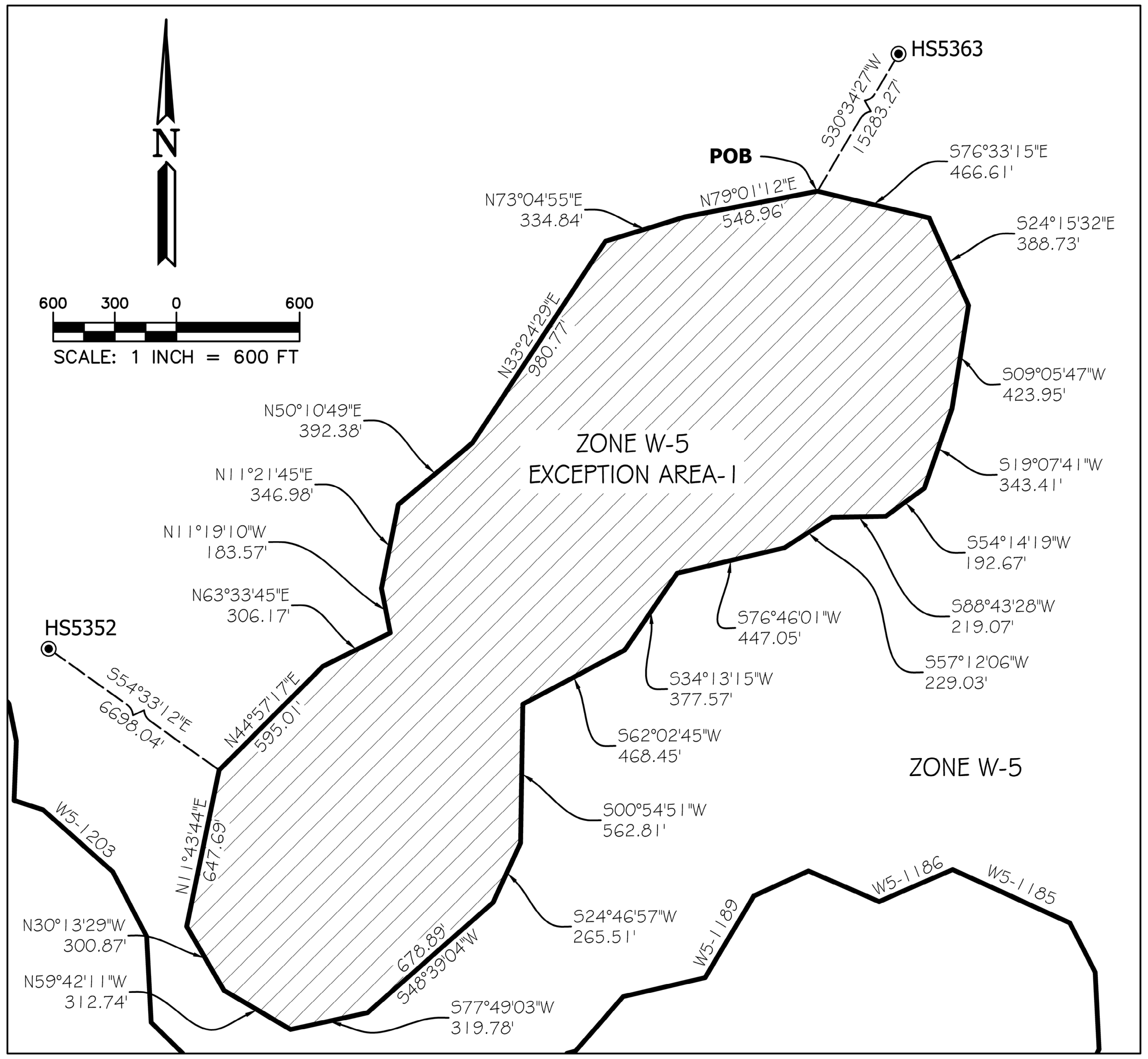
LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

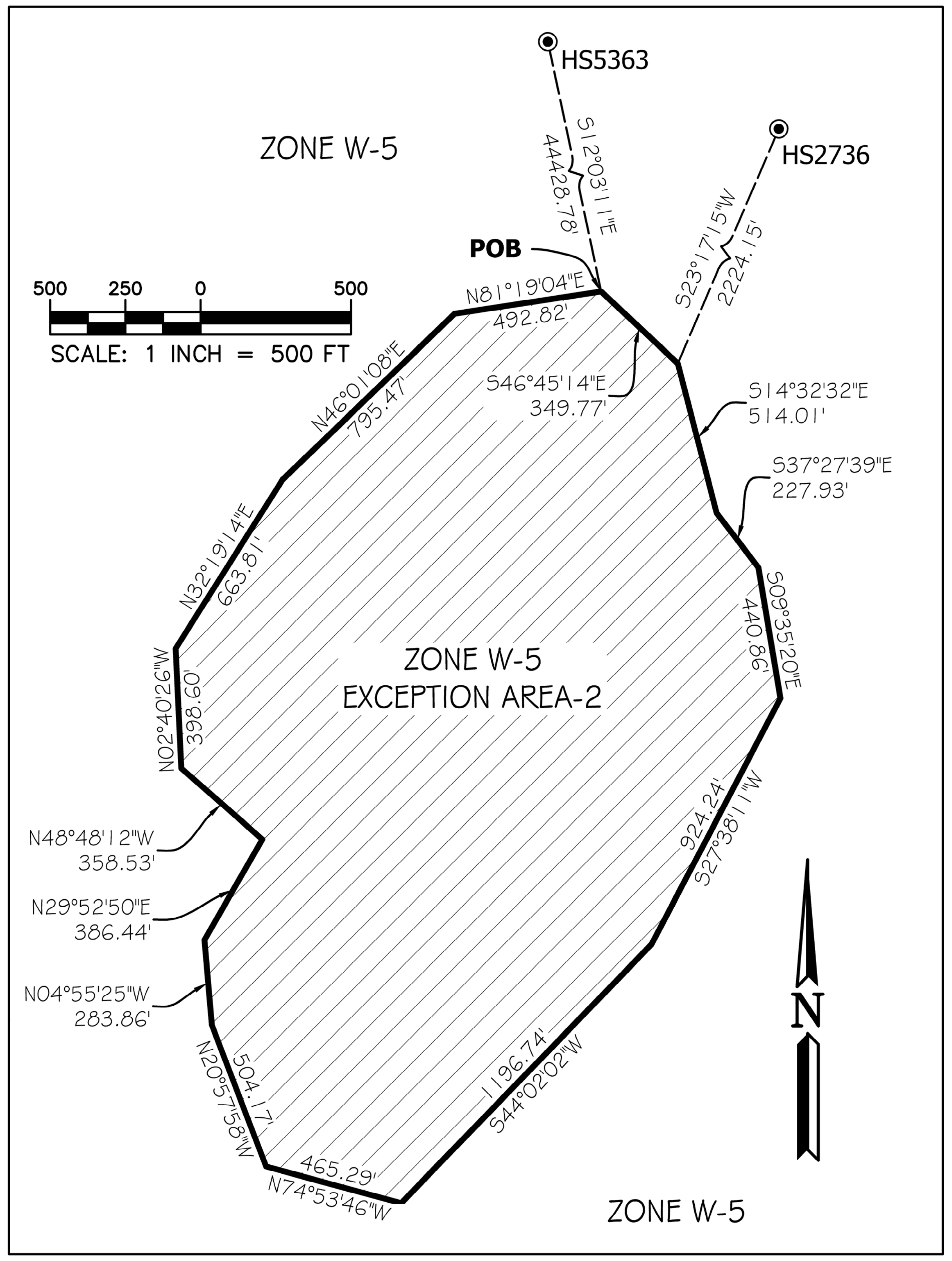
****

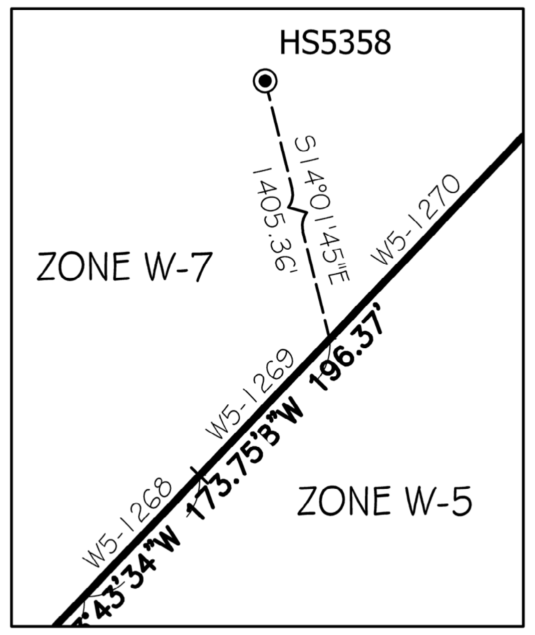
SCALE: AS NOTED FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310



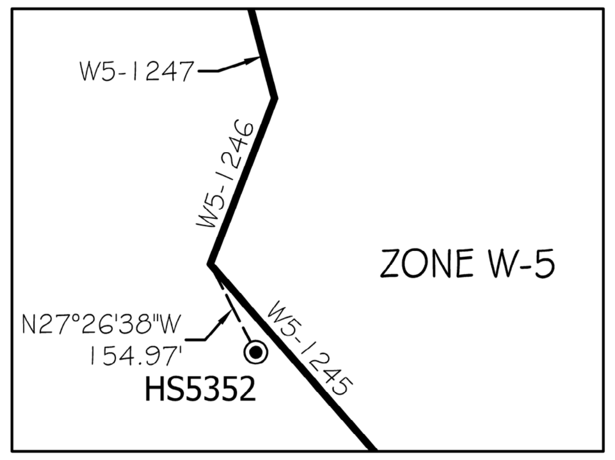




DETAIL 5S

N.T.S.

(SEE SHEET 13 FOR LOCATION)



DETAIL 5R

N.T.S.

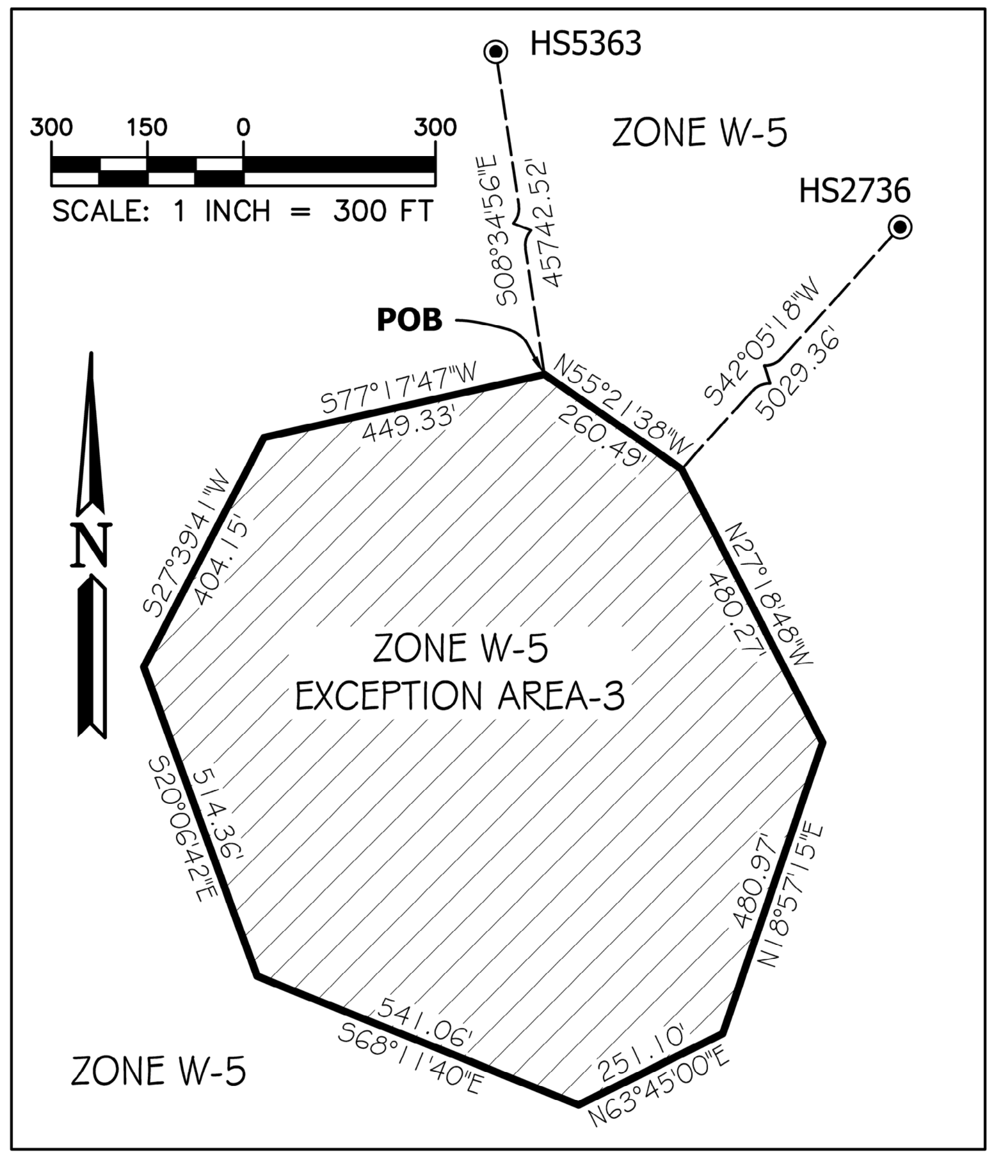
(SEE SHEET 13 FOR LOCATION)

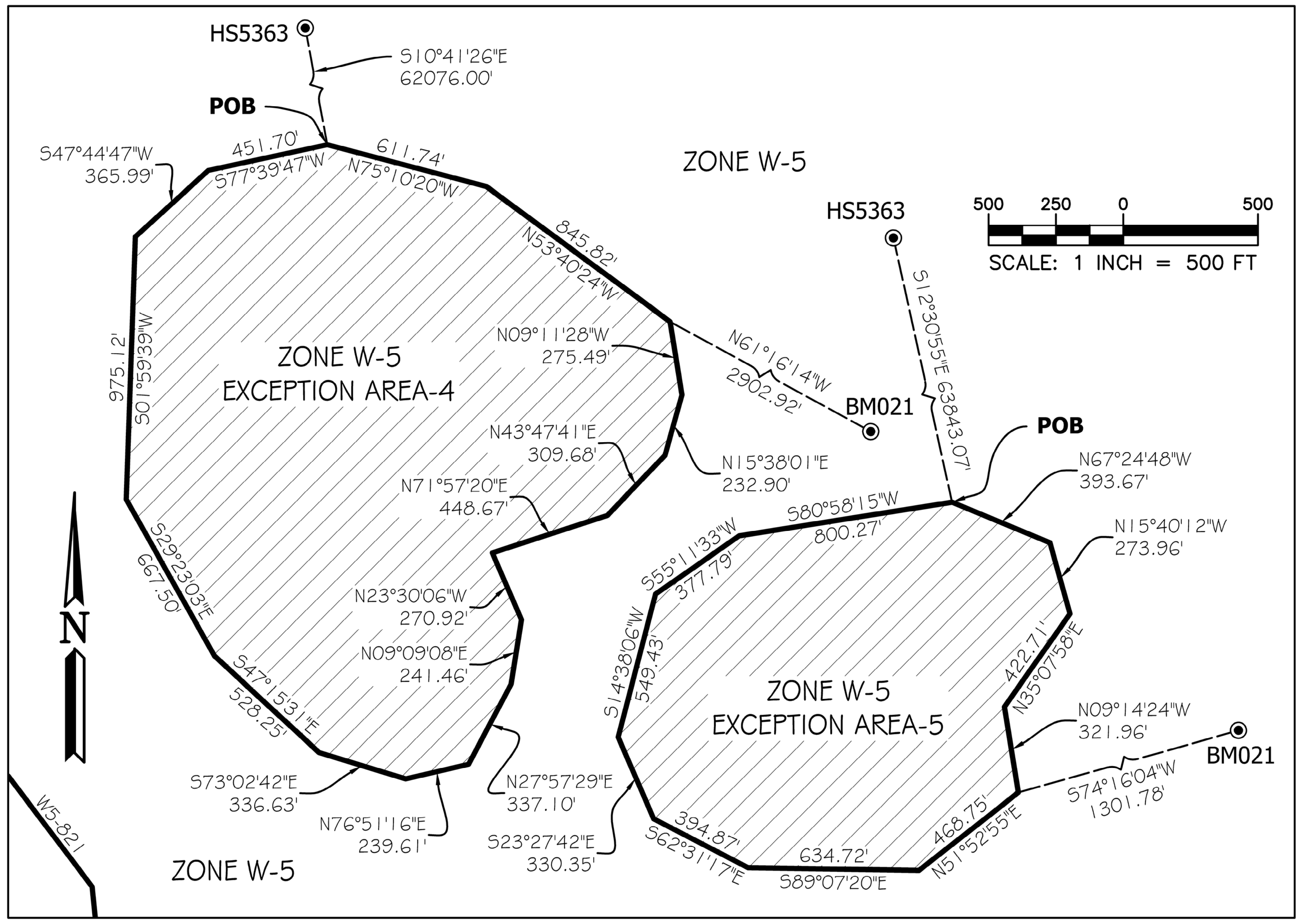
LEGEND

- ● - NGS / SCVWD MONUMENT
- — — — — - GPS VECTOR (GRID TIE)
- ▬▬▬ - SCVWD ZONE W-5

NOTE

1. LINE TABLE SHOWN ON SHEET 15-17 REPRESENTS THE COURSES OF ZONE W-5 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN HERE.
2. SEE SHEET 13 FOR GENERAL LOCATION OF EXCEPTION AREAS.





RECORD OF SURVEY NO. ____

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

BY: **TOWILL** Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 14 OF 21

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1	S55°41'00"E	117.74'
W5-2	S69°07'16"E	269.96'
W5-3	S54°34'53"E	534.66'
W5-4	S19°39'30"E	213.43'
W5-5	S40°32'47"E	261.62'
W5-6	S11°00'22"E	637.40'
W5-7	S24°41'52"E	596.78'
W5-8	S39°44'28"E	712.73'
W5-9	S22°48'04"W	270.47'
W5-10	S00°05'09"E	583.31'
W5-11	S26°13'57"E	672.47'
W5-12	S63°44'01"E	678.75'
W5-13	N78°16'15"E	428.62'
W5-14	S26°38'39"E	196.44'
W5-15	S61°18'41"E	557.31'
W5-16	N81°53'24"E	340.24'
W5-17	S34°50'06"E	225.78'
W5-18	S50°04'25"E	194.27'
W5-19	S10°57'44"E	141.82'
W5-20	S40°03'06"E	187.54'
W5-21	S75°18'40"E	297.77'
W5-22	S40°01'25"E	211.26'
W5-23	S70°16'53"E	190.39'
W5-24	S31°34'45"E	335.32'
W5-25	S70°39'57"E	208.04'
W5-26	S37°30'52"E	340.90'
W5-27	S73°57'51"E	222.13'
W5-28	S44°00'13"E	279.62'
W5-29	S69°55'58"E	149.59'
W5-30	N83°50'04"E	175.55'
W5-31	S36°44'40"E	93.79'
W5-32	S56°50'36"E	246.43'
W5-33	S82°03'21"E	200.34'
W5-34	S08°54'25"E	86.03'
W5-35	S29°48'32"E	151.71'
W5-36	S54°22'03"E	564.82'
W5-37	S79°51'38"E	201.10'
W5-38	S44°35'18"E	59.92'
W5-39	S02°57'43"W	316.92'
W5-40	S08°07'03"E	90.42'
W5-41	S24°46'18"E	899.71'
W5-42	S44°10'17"E	459.27'
W5-43	S60°03'28"E	172.59'
W5-44	S11°33'57"E	151.15'
W5-45	S35°39'43"E	885.43'
W5-46	S49°21'36"E	145.80'
W5-47	S77°53'43"E	177.10'
W5-48	S41°02'12"E	100.72'
W5-49	S58°31'45"E	100.40'
W5-50	S28°41'02"E	83.30'
W5-51	S43°49'05"E	88.62'
W5-52	S15°55'16"E	197.56'
W5-53	S46°03'15"E	206.81'
W5-54	S06°28'16"E	302.05'
W5-55	S33°42'58"E	404.15'
W5-56	S51°20'26"E	760.48'
W5-57	S73°54'01"E	241.85'
W5-58	S36°46'47"E	212.96'
W5-59	S74°26'17"E	227.94'
W5-60	S22°20'35"E	325.15'
W5-61	S36°56'39"E	165.41'
W5-62	S64°18'17"E	313.84'
W5-63	S10°57'14"E	193.78'
W5-64	S37°27'42"E	781.57'
W5-65	S53°02'12"E	113.50'
W5-66	S17°04'08"W	42.95'
W5-67	S82°56'04"W	177.64'
W5-68	S63°36'58"W	217.07'
W5-69	S40°39'37"W	422.44'
W5-70	S20°20'03"W	913.22'
W5-71	S05°49'05"E	485.13'
W5-72	S12°14'46"W	554.19'
W5-73	S09°06'24"E	975.02'
W5-74	S01°36'18"W	635.55'
W5-75	[illegible]36"E	514.84'
W5-76	S33°01'11"E	491.98'
W5-77	S44°14'57"E	951.17'
W5-78	S53°17'32"E	905.85'
W5-79	S80°13'19"E	581.98'
W5-80	S76°24'27"E	778.93'
W5-81	S65°24'12"E	643.79'
W5-82	S45°51'59"E	480.28'
W5-83	S73°35'54"E	461.59'
W5-84	S22°27'04"E	1014.26'
W5-85	S42°49'43"E	143.69'
W5-86	S05°04'29"W	717.50'
W5-87	S09°06'18"E	832.17'
W5-88	S27°26'20"E	206.40'
W5-89	S48°41'53"E	345.84'
W5-90	S10°42'3[illegible]"W	31[illegible].04'
W5-91	S10°34'41"E	584.53'
W5-92	S32°33'30"E	659.79'
W5-93	S44°58'16"E	749.79'
W5-94	S63°41'29"E	699.23'
W5-95	S86°49'32"E	323.68'
W5-96	S26°28'43"E	732.95'
W5-97	S58°06'02"E	500.28'
W5-98	S83°19'55"E	441.72'
W5-99	S51°40'40"E	798.37'
W5-100	S86°10'02"E	260.67'
W5-101	S33°58'06"E	635.52'
W5-102	S55°42'17"E	975.87'
W5-103	S30°52'01"W	301.18'
W5-104	S11°07'37"W	3[illegible]2.[illegible]
W5-105	S07°19'33"E	643.49'
W5-106	S46°02'40"W	398.68'
W5-107	S04°27'25"E	242.33'
W5-108	S48°38'14"E	264.78'
W5-109	S15°04'06"W	138.68'
W5-110	S09°29'55"E	193.97'
W5-111	S42°28'55"W	361.77'
W5-112	S21°28'34"W	235.21'
W5-113	S20°42'32"E	467.19'
W5-114	S09°36'09"W	427.52'
W5-115	S40°37'36"W	134.59'
W5-116	S10°49'59"W	729.60'
W5-117	S08°23'56"E	1078.27'
W5-118	S23°11'03"E	344.04'
W5-119	S35°50'36"E	662.47'
W5-120	S47°47'36"E	316.70'
W5-121	S70°35'02"E	280.08'
W5-122	S36°36'10"E	783.70'
W5-123	S72°01'06"E	393.26'
W5-124	S31°35'00"E	259.93'
W5-125	S53°11'28"E	1421.52'
W5-126	S72°44'42"E	554.50'
W5-127	N83°39'49"E	640.73'
W5-128	S63°18'40"E	317.43'
W5-129	S83°53'20"E	429.14'
W5-130	S45°36'47"E	1405.56'
W5-131	S31°57'16"E	358.31'
W5-132	S49°24'44"E	1321.13'
W5-133	S68°01'54"E	370.45'
W5-134	N88°40'12"E	542.14'
W5-135	S38°49'26"E	770.45'
W5-136	S52°15'51"E	544.14'
W5-137	S15°12'40"E	532.04'
W5-138	S25°16'28"E	1030.05'
W5-139	S10°50'59"E	648.00'
W5-140	S28°45'10"E	201.71'
W5-141	S69°38'46"E	362.84'
W5-142	S30°28'15"E	1291.82'
W5-143	S17°34'44"E	489.13'
W5-144	S35°40'38"E	1017.41'
W5-145	S49°28'33"E	849.54'
W5-146	S23°34'05"E	748.05'
W5-147	S38°44'09"E	1577.40'
W5-148	S24°21'08"E	557.45'
W5-149	S07°40'50"E	1247.69'
W5-150	S37°53'47"E	601.39'
W5-151	S25°47'02"E	948.46'
W5-152	S48°15'12"E	461.90'
W5-153	S79°55'58"E	237.36'
W5-154	S33°29'57"E	596.39'
W5-155	S47°21'23"E	1262.03'
W5-156	S71°55'11"E	483.65'
W5-157	S03°48'43"E	591.63'
W5-158	S22°06'48"E	482.18'
W5-159	S41°03'47"W	178.07'
W5-160	S18°48'32"W	658.48'
W5-161	S37°39'31"W	499.30'
W5-162	S01°39'06"E	463.95'
W5-163	S32°06'54"E	390.24'
W5-164	S30°40'18"W	185.03'
W5-165	S06°09'06"W	245.85'
W5-166	S22°39'50"E	464.98'
W5-167	S44°06'50"E	1631.18'
W5-168	S17°04'11"E	1149.72'
W5-169	S42°36'25"E	153.01'
W5-170	S16°56'07"W	644.46'
W5-171	S02°16'58"W	165.98'
W5-172	S11°04'49"E	484.19'
W5-173	S02°38'27"E	546.74'
W5-174	S15°16'36"E	827.10'
W5-175	S40°28'43"E	573.06'
W5-176	S64°01'48"E	627.92'
W5-177	S29°02'42"E	432.71'
W5-178	S73°07'37"E	343.28'
W5-179	S22°55'01"E	135.24'
W5-180	S22°55'01"E	512.71'
W5-181	S54°20'18"E	530.62'
W5-182	S25°50'57"W	119.52'
W5-183	S00°48'57"E	182.51'
W5-184	S33°39'29"E	716.08'
W5-185	S54°23'11"E	425.77'
W5-186	S29°04'33"W	903.84'
W5-187	N69°26'05"W	1241.26'
W5-188	N69°25'10"W	563.80'
W5-189	N69°25'11"W	358.69'
W5-190	N69°25'11"W	33.54'
W5-191	S39°20'38"W	119.97'
W5-192	S39°08'38"W	65.17'
W5-193	S39°36'52"W	48.26'
W5-194	S42°28'17"W	146.19'
W5-195	S42°47'39"W	64.37'
W5-196	S42°32'18"W	855.03'
W5-197	S42°33'10"W	1531.84'
W5-198	S42°33'10"W	1032.75'
W5-199	S42°34'31"W	628.25'
W5-200	S42°34'48"W	226.73'
W5-201	S42°27'43"W	777.68'
W5-202	S41°14'39"W	117.54'
W5-203	S21°36'54"W	180.97'
W5-204	S30°49'30"E	8.96'
W5-205	S35°25'39"W	13.30'
W5-206	S17°21'34"W	9.13'
W5-207	S46°02'00"W	17.64'
W5-208	S15°04'27"W	10.53'
W5-209	S37°31'37"W	21.40'
W5-210	S19°47'09"W	127.21'
W5-211	S17°21'36"W	54.75'
W5-212	S13°14'59"W	25.37'
W5-213	S35°01'25"W	36.19'
W5-214	S37°57'58"W	37.56'
W5-215	S44°16'16"W	18.62'
W5-216	S33°18'37"W	28.12'
W5-217	S40°26'59"W	59.75'
W5-218	S34°42'43"W	42.21'
W5-219	S35°54'47"W	7.58'
W5-220	S39°10'13"W	69.84'
W5-221	S17°21'35"W	18.25'
W5-222	S41°23'40"W	19.23'
W5-223	S19°35'27"W	16.17'
W5-224	S46°49'28"W	10.52'
W5-225	S20°01'11"W	31.66'
W5-226	S36°56'58"W	21.70'
W5-227	S22°28'29"W	94.16'
W5-228	S17°40'11"W	12.95'
W5-229	S33°07'12"W	14.68'
W5-230	S15°04'35"W	10.53'
W5-231	S32°08'50"W	14.52'
W5-232	S18°47'13"W	42.15'
W5-233	S35°01'28"W	18.09'
W5-234	S21°40'43"W	29.26'
W5-235	S14°31'05"W	35.26'
W5-236	S21°58'42"W	62.56'
W5-237	S35°01'29"W	18.09'
W5-238	S12°47'42"W	63.70'
W5-239	S33°28'13"W	71.08'
W5-240	S43°33'42"W	74.61'
W5-241	S46°46'40"W	24.71'
W5-242	S54°05'36"W	25.08'
W5-243	S74°12'05"W	83.76'
W5-244	S53°01'43"W	12.54'
W5-245	N86°38'29"W	7.60'
W5-246	S56°45'00"W	9.15'
W5-247	S46°32'09"W	60.19'
W5-248	S18°02'49"W	26.33'
W5-249	S01°18'00"E	52.46'
W5-250	S10°54'13"E	23.41'
W5-251	S35°00'14"E	12.54'
W5-252	S13°36'57"E	72.50'
W5-253	S04°24'48"E	83.34'
W5-254	S19°52'34"W	23.91'
W5-255	S12°29'38"W	38.32'
W5-256	S32°12'52"W	64.12'
W5-257	S34°06'49"W	59.82'
W5-258	S41°20'56"W	19.70'
W5-259	S19°17'00"W	65.72'
W5-260	S06°45'48"W	133.67'
W5-261	S01°41'04"W	62.64'
W5-262	S09°10'18"W	47.13'
W5-263	S25°00'42"W	9.20'
W5-264	S05°07'04"W	57.49'
W5-265	S05°07'04"W	20.67'
W5-266	S22°06'55"W	21.52'
W5-267	S01°44'11"W	14.93'
W5-268	S07°29'26"W	49.31'
W5-269	S07°29'26"W	92.25'
W5-270	S33°07'22"W	14.68'
W5-271	S20°34'25"W	53.07'
W5-272	S41°20'56"W	19.70'
W5-273	S12°36'24"W	12.66'
W5-274	S35°01'36"W	36.19'
W5-275	S17°21'48"W	20.76'
W5-276	S17°21'48"W	15.75'
W5-277	S01°34'23"W	20.70'
W5-278	S01°34'23"W	14.26'
W5-279	S08°16'27"E	43.49'
W5-280	S36°04'31"E	12.71'
W5-281	S09°38'23"W	70.78'
W5-282	S41°26'53"W	31.28'
W5-283	S30°18'23"W	15.93'
W5-284	S43°14'38"W	67.30'
W5-285	S48°07'48"W	32.88'
W5-286	S60°00'23"W	33.61'
W5-287	S56°11'20"W	21.25'
W5-288	S74°01'19"W	42.07'
W5-289	S88°29'08"W	235.07'
W5-290	N88°20'55"W	20.16'
W5-291	N51°47'55"W	12.54'
W5-292	S75°30'24"W	36.32'
W5-293	S88°13'48"W	87.44'
W5-294	S83°33'36"W	133.37'
W5-295	S75°59'15"W	44.69'
W5-296	S54°22'28"W	12.32'
W5-297	S80°45'10"W	12.75'
W5-298	S79°38'44"W	13.39'
W5-299	N87°47'45"W	13.15'
W5-300	S86°29'07"W	40.43'
W5-301	S13°53'46"W	12.72'
W5-302	S00°37'02"W	25.85'
W5-303	S09°44'06"W	12.91'
W5-304	S21°18'19"W	13.23'
W5-305	S41°04'07"W	30.62'
W5-306	S42°00'57"W	34.46'
W5-307	S34°16'06"W	38.49'
W5-308	S27°52'39"W	38.91'
W5-309	S36°35'10"W	51.74'
W5-310	S27°55'18"W	64.33'
W5-311	S18°47'28"W	25.29'
W5-312	S21°52'38"W	25.79'
W5-313	S22°50'53"W	63.33'
W5-314	S14°56'26"W	33.07'
W5-315	S14°09'13"W	18.73'
W5-316	S21°52'42"W	12.89'
W5-317	S14°04'11"W	38.94'
W5-318	S07°28'53"W	124.69'
W5-319	S07°37'35"W	131.70'
W5-320	S03°53'56"W	25.53'
W5-321	S08°50'03"W	50.62'
W5-322	S08°50'03"W	158.87'
W5-323	S08°50'03"W	21.54'
W5-324	S06°35'34"W	25.26'
W5-325	S12°46'06"W	167.97'
W5-326	S07°39'13"W	4.77'
W5-327	S11°06'35"W	33.70'
W5-328	S24°38'47"W	25.12'
W5-329	S20°19'02"W	25.14'
W5-330	S16°25'54"W	25.73'
W5-331	S24°54'46"W	12.78'
W5-332	S34°12'28"W	12.68'
W5-333	S42°41'38"W	51.02'
W5-334	S41°49'08"W	15.97'
W5-335	S42°35'53"W	48.49'
W5-336	S43°28'34"W	15.89'
W5-337	S42°39'50"W	51.48'
W5-338	S52°47'14"W	25.53'
W5-339	S43°24'59"W	12.90'
W5-340	S52°56'29"W	26.21'
W5-341	S65°16'14"W	39.12'
W5-342	S82°33'30"W	12.98'
W5-343	S69°22'23"W	39.19'
W5-344	S77°51'12"W	26.36'
W5-345	N89°22'51"W	13.15'
W5-346	S85°47'22"W	51.90'
W5-347	N87°01'45"W	26.61'
W5-348	N80°51'20"W	39.30'
W5-349	N78°20'48"W	78.00'
W5-350	N86°12'39"W	26.34'
W5-351	S76°46'52"W	25.88'
W5-352	S80°04'36"W	91.54'
W5-353	S75°23'42"W	26.35'
W5-354	S65°50'42"W	26.07'
W5-355	S69°25'47"W	14.10'
W5-356	S71°42'13"W	12.35'
W5-357	S58°41'41"W	26.16'
W5-358	S54°16'59"W	52.23'
W5-359	S41°54'35"W	25.68'
W5-360	S46°44'32"W	51.48'
W5-361	S42°20'38"W	4.39'
W5-362	S41°52'32"W	20.83'
W5-363	S31°23'22"W	26.27'
W5-364	S33°54'30"W	36.69'
W5-365	S33°54'30"W	1.64'
W5-366	S30°49'41"W	21.49'
W5-367	S11°02'25"E	13.01'
W5-368	S00°41'38"E	16.08'
W5-369	S00°41'38"E	9.42'
W5-370	S05°27'31"E	77.26'
W5-371	S09°15'55"E	64.68'
W5-372	S07°59'08"E	53.77'
W5-373	S07°59'08"E	10.68'
W5-374	S14°16'24"E	64.80'
W5-375	S26°38'55"E	50.38'
W5-376	S30°25'26"E	25.50'
W5-377	S34°03'24"E	38.52'
W5-378	S43°08'23"E	104.35'
W5-379	S51°28'08"E	38.52'
W5-380	S56°18'45"E	38.70'
W5-381	S59°10'46"E	51.39'
W5-382	S48°24'27"E	12.77'
W5-383	S60°33'39"E	25.68'
W5-384	S54°41'15"E	25.59'
W5-385	S57°04'48"E	47.01'
W5-386	S57°27'24"E	29.61'
W5-387	S54°07'09"E	63.70'
W5-388	S57°37'47"E	51.20'
W5-389	S51°28'12"E	38.52'
W5-390	S45°55'29"E	38.64'
W5-391	S42°10'50"E	25.80'
W5-392	S29°18'07"[illegible]	[illegible]63.85'
W5-393	S23°02'58"E	51.68'
W5-394	S17°33'26"E	25.29'
W5-395	S07°19'55"E	141.54'
W5-396	S00°52'41"W	64.45'
W5-397	S06°00'46"W	12.43'
W5-398	S00°40'37"E	25.86'
W5-399	S05°56'05"W	25.23'
W5-400	S00°17'23"W	50.98'
W5-401	S05°12'25"W	25.57'
W5-402	S01°55'11"W	38.61'
W5-403	S03°41'44"W	76.21'
W5-404	S07°48'22"W	25.69'
W5-405	S00°21'34"E	51.35'
W5-406	S04°33'13"W	25.55'
W5-407	S00°18'27"W	269.08'
W5-408	S02°35'17"W	14.59'
W5-409	S02°35'17"W	10.91'
W5-410	S10°46'18"W	89.52'
W5-411	S17°40'41"W	38.85'
W5-412	S23°59'23"W	25.78'
W5-413	S19°04'29"W	38.77'
W5-414	S32°18'28"W	38.94'
W5-415	S46°03'33"W	25.43'
W5-416	S42°54'27"W	51.68'
W5-417	S54°21'14"W	38.78'
W5-418	S69°17'52"W	26.04'
W5-419	S64°41'52"W	183.25'
W5-420	S77°51'18"W	13.18'
W5-421	S70°16'21"W	26.18'
W5-422	S62°37'07"W	51.96'
W5-423	S55°32'39"W	64.63'
W5-424	S62°06'43"W	12.97'
W5-425	S49°09'48"W	52.25'
W5-426	S36°21'27"W	13.01'
W5-427	S30°17'01"W	25.98'
W5-428	S01°42'53"W	15.30'
W5-429	S15°35'49"W	26.01'
W5-430	S04°31'58"W	64.23'
W5-431	S05°55'15"E	25.65'
W5-432	S09°11'41"E	147.44'
W5-433	S08°30'01"E	5.53'
W5-434	S15°11'46"E	12.87'
W5-435	S04°17'42"E	51.16'
W5-436	S12°17'47"E	13.07'
W5-437	S20°11'45"E	51.81'
W5-438	S38°07'49"E	13.07'
W5-439	S00°41'41"E	12.75'
W5-440	S18°24'43"E	90.51'
W5-441	S08°37'48"E	25.45'
W5-442	S03°47'35"E	37.98'
W5-443	S01°16'33"W	25.49'
W5-444	S02°18'06"E	63.07'
W5-445	S06°00'56"E	25.29'
W5-446	S00°37'10"W	25.12'
W5-447	S02°42'33"E	50.33'
W5-448	S07°09'35"W	12.83'
W5-449	S03°22'41"E	138.33'
W5-450	S18°11'00"E	12.69'
W5-451	S02°05'01"E	24.79'
W5-452	S07°56'19"E	88.37'
W5-453	S01°35'26"E	37.90'
W5-454	S02°55'06"W	7.29'
W5-455	S02°38'51"W	24.77'
W5-456	S04°05'07"W	19.33'
W5-457	S03°25'52"E	12.41'
W5-458	S03°54'01"W	25.53'
W5-459	S04°46'25"E	12.43'
W5-460	S12°57'59"W	4.10'
W5-461	S17°22'12"W	9.13'
W5-462	S00°28'32"E	15.30'
W5-463	S23°42'43"W	12.67'
W5-464	S12°42'00"W	16.76'
W5-465	S12°09'09"W	21.92'
W5-466	S09°18'42"W	38.68'
W5-467	S23°42'43"W	12.67'
W5-468	S04°09'10"W	18.97'
W5-469	S04°33'18"W	12.77'
W5-470	S18°25'07"W	51.63'
W5-471	S10°43'50"W	3.33'
W5-472	S14°53'51"W	61.62'
W5-473	S17°11'03"W	64.58'
W5-474	S11°48'19"W	25.61'
W5-475	S14°58'26"W	51.87'
W5-476	S12°23'24"W	38.68'
W5-477	S15°47'00"W	29.05'
W5-478	S15°35'56"W	9.05'
W5-479	S24°55'03"W	25.57'
W5-480	S13°42'58"W	51.59'
W5-481	S20°39'48"W	38.37'
W5-482	S26°27'07"W	25.49'
W5-483	S17°55'12"W	76.65'
W5-484	S16°07'21"W	51.39'
W5-485	S33°36'59"W	38.64'
W5-486	S35°52'48"W	190.85'
W5-487	S36°07'34"W	68.43'
W5-488	S24°55'07"W	25.57'
W5-489	S33°51'52"W	26.12'
W5-490	S29°09'16"W	25.70'
W5-491	S25°01'38"W	140.74'
W5-492	S11°00'57"W	12.96'
W5-493	S27°59'49"W	12.71'
W5-494	S37°23'30"W	13.18'
W5-495	S20°56'51"W	25.24'
W5-496	S16°14'49"W	24.95'
W5-497	S24°09'21"W	51.23'
W5-498	S13°54'12"W	12.72'
W5-499	S23°31'52"W	89.34'
W5-500	S33°37'04"W	38.64'
W5-501	S25°15'33"W	25.24'
W5-502	S33°19'34"W	51.93'
W5-503	S23°23'45"W	25.67'
W5-504	S40°22'31"W	26.05'
W5-505	S44°47'47"W	38.58'
W5-506	S48°50'25"W	38.80'
W5-507	S58°42'02"W	52.34'
W5-508	S61°24'51"W	26.12'
W5-509	S53°20'10"W	13.22'
W5-510	S63°27'47"W	39.09'
W5-511	S69°18'07"W	78.12'
W5-512	S82°44'24"W	13.28'
W5-513	S72°32'56"W	12.91'
W5-514	S65°56'27"W	39.24'
W5-515	S70°16'36"W	26.18'
W5-516	S65°51'06"W	52.14'
W5-517	S68°19'01"W	51.81'
W5-518	S75°40'26"W	12.70'
W5-519	S65°51'05"W	26.07'
W5-520	S70°25'51"W	51.69'
W5-521	S54°05'26"W	13.46'
W5-522	S68°34'47"W	12.61'
W5-523	S77°51'29"W	13.19'
W5-524	S65°07'48"W	26.23'
W5-525	S53°35'10"W	25.99'
W5-526	S49°39'13"W	38.32'
W5-527	S39°22'28"W	13.07'
W5-528	S49°25'14"W	14.37'
W5-529	S51°23'56"W	10.94'
W5-530	S43°25'35"W	38.71'
W5-531	S33°19'39"W	12.98'
W5-532	S24°55'17"W	12.78'
W5-533	S39°22'30"W	26.15'
W5-534	S30°49'40"W	38.34'
W5-535	S27°47'05"W	64.66'
W5-536	S20°40'01"W	12.79'
W5-537	S14°57'48"W	50.74'
W5-538	S16°58'36"W	141.16'
W5-539	S14°12'14"W	38.58'
W5-540	S07°57'29"W	38.91'
W5-541	S14°46'50"W	13.14'
W5-542	S03°10'35"W	13.12'
W5-543	S26°06'14"W	12.91'
W5-544	S14°58'39"W	25.93'
W5-545	S19°46'52"W	25.83'
W5-546	S29°50'25"W	64.66'
W5-547	S43°25'39"W	38.71'
W5-548	S46°40'49"W	64.54'
W5-549	S53°16'07"W	52.21'
W5-550	S59°23'08"W	25.98'
W5-551	S66°50'39"W	26.19'
W5-552	S85°52'33"W	13.20'
W5-553	S72°20'56"W	25.55'
W5-554	S78°43'03"W	38.83'
W5-555	S81°01'45"W	117.97'
W5-556	S82°56'44"W	79.03'
W5-557	S80°11'42"W	26.15'
W5-558	S89°39'33"W	64.89'
W5-559	N85°22'21"W	26.08'
W5-560	S87°49'08"W	62.08'
W5-561	S74°06'08"W	12.80'
W5-562	S67°17'46"W	49.65'
W5-563	S62°41'39"W	15.55'
W5-564	S55°01'40"W	65.06'
W5-565	S48°00'38"W	25.81'
W5-566	S55°29'31"W	38.60'
W5-567	S62°43'28"W	13.23'
W5-568	S54°56'35"W	51.81'
W5-569	S51°48'35"W	65.64'
W5-570	S49°50'50"W	20.55'
W5-571	S49°50'50"W	44.68'
W5-572	S46°36'05"W	19.11'
W5-573	S46°36'05"W	71.53'
W5-574	S48°43'08"W	129.20'
W5-575	S45°29'28"W	25.6[illegible]
W5-576	S48°50'44"W	38.80'

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W-5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE   FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 15 OF 21

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-577	S45°52'33"W	38.27'
W5-578	S47°35'30"W	167.53'
W5-579	S44°10'47"W	51.75'
W5-580	S48°00'42"W	25.81'
W5-581	S45°26'53"W	64.68'
W5-582	S42°55'09"W	51.68'
W5-583	S46°58'48"W	25.85'
W5-584	S41°25'46"W	25.49'
W5-585	S46°58'48"W	25.85'
W5-586	S44°29'25"W	76.76'
W5-587	S47°07'12"W	1.99'
W5-588	S47°07'12"W	23.40'
W5-589	S35°37'10"W	38.22'
W5-590	S20°51'32"W	1.45'
W5-591	S20°51'32"W	36.58'
W5-592	S26°06'33"W	12.91'
W5-593	S36°22'07"W	13.01'
W5-594	S09°13'31"W	25.41'
W5-595	S20°32'16"W	309.81'
W5-596	S16°26'39"W	38.60'
W5-597	S08°31'01"W	51.09'
W5-598	S14°12'32"W	38.58'
W5-599	S20°07'36"W	13.13'
W5-600	S10°13'06"W	77.18'
W5-601	S29°09'46"W	12.85'
W5-602	S22°41'41"W	38.90'
W5-603	S20°23'47"W	103.69'
W5-604	S36°18'48"W	25.55'
W5-605	S32°53'53"W	64.59'
W5-606	S31°13'49"W	64.30'
W5-607	S43°26'01"W	38.71'
W5-608	S46°54'51"W	52.16'
W5-609	S43°26'03"W	25.81'
W5-610	S56°51'41"W	91.06'
W5-611	S60°45'24"W	51.91'
W5-612	S50°30'25"W	13.00'
W5-613	S66°18'35"W	65.43'
W5-614	S63°23'13"W	64.43'
W5-615	S64°51'34"W	77.89'
W5-616	S61°39'23"W	39.09'
W5-617	S72°57'03"W	13.19'
W5-618	S55°56'31"W	12.80'
W5-619	S62°19'45"W	39.17'
W5-620	S73°19'44"W	39.18'
W5-621	S67°30'58"W	34.32'
W5-622	S77°51'58"W	13.19'
W5-623	S59°22'31"W	13.33'
W5-624	S74°56'29"W	52.52'
W5-625	S67°46'19"W	104.99'
W5-626	S61°24'22"W	105.16'
W5-627	S60°10'32"W	145.12'
W5-628	S57°21'29"W	91.59'
W5-629	S49°16'45"W	78.26'
W5-630	S51°29'01"W	104.40'
W5-631	S47°59'31"W	9.14'
W5-632	S48°04'50"W	30.15'
W5-633	S35°18'46"W	12.84'
W5-634	S44°49'21"W	243.03'
W5-635	S44°49'21"W	31.19'
W5-636	S43°06'49"W	17.36'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-637	S43°06'49"W	87.80'
W5-638	S45°33'59"W	91.04'
W5-639	S29°10'03"W	12.85'
W5-640	S39°29'49"W	38.92'
W5-641	S39°29'49"W	78.93'
W5-642	S31°49'10"W	25.96'
W5-643	S35°47'31"W	156.33'
W5-644	S37°32'30"W	19.38'
W5-645	S37°32'30"W	58.49'
W5-646	S40°52'50"W	26.24'
W5-647	S45°06'53"W	91.35'
W5-648	S55°07'32"W	39.50'
W5-649	S50°37'49"W	54.95'
W5-650	S50°55'22"W	62.69'
W5-651	S52°57'50"W	52.44'
W5-652	S55°38'22"W	118.10'
W5-653	S58°02'23"W	65.57'
W5-654	S56°41'43"W	78.92'
W5-655	S69°32'46"W	26.31'
W5-656	S62°37'10"W	156.60'
W5-657	S68°05'00"W	13.29'
W5-658	S63°10'03"W	91.58'
W5-659	S55°33'32"W	39.29'
W5-660	S74°28'40"W	13.09'
W5-661	S66°15'46"W	52.95'
W5-662	S71°02'29"W	15.33'
W5-663	S71°02'29"W	10.74'
W5-664	S62°53'47"W	65.72'
W5-665	S60°44'13"W	71.92'
W5-666	S60°44'13"W	59.57'
W5-667	S70°17'28"W	26.19'
W5-668	S59°55'53"W	65.61'
W5-669	S54°31'19"W	65.49'
W5-670	S57°09'06"W	39.60'
W5-671	S60°25'02"W	26.05'
W5-672	S55°07'41"W	39.50'
W5-673	S60°44'12"W	13.15'
W5-674	S66°51'29"W	26.19'
W5-675	S57°35'37"W	39.40'
W5-676	S64°25'52"W	26.39'
W5-677	S60°54'37"W	105.02'
W5-678	S59°07'25"W	65.49'
W5-679	S55°48'17"W	39.53'
W5-680	S44°22'47"W	26.21'
W5-681	S33°20'41"W	12.98'
W5-682	S26°42'05"W	25.94'
W5-683	S17°14'14"W	13.30'
W5-684	S10°23'39"W	25.86'
W5-685	S25°39'15"W	51.83'
W5-686	S20°34'18"W	52.29'
W5-687	S25°16'37"W	143.01'
W5-688	S21°36'44"W	26.13'
W5-689	S14°59'29"W	25.93'
W5-690	S23°06'07"W	13.00'
W5-691	S33°53'02"W	26.12'
W5-692	S26°21'12"W	26.27'
W5-693	S20°24'21"W	25.92'
W5-694	S38°23'28"W	78.29'
W5-695	S45°37'19"W	52.51'
W5-696	S57°42'07"W	26.12'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-697	S60°56'59"W	39.70'
W5-698	S78°38'48"W	26.30'
W5-699	S72°57'35"W	13.19'
W5-700	S61°56'31"W	65.98'
W5-701	S58°22'57"W	52.54'
W5-702	S56°01'25"W	90.34'
W5-703	S56°01'25"W	41.07'
W5-704	S49°12'46"W	130.98'
W5-705	S54°12'08"W	39.24'
W5-706	S46°45'36"W	125.56'
W5-707	S46°45'36"W	189.12'
W5-708	S51°45'20"W	77.73'
W5-709	S57°46'43"W	65.77'
W5-710	S60°44'31"W	26.30'
W5-711	S57°23'16"W	33.21'
W5-712	S58°05'55"W	85.30'
W5-713	S56°01'32"W	78.85'
W5-714	S63°35'12"W	52.84'
W5-715	S66°37'42"W	52.80'
W5-716	S70°30'57"W	26.46'
W5-717	S74°28'55"W	26.17'
W5-718	S15°37'06"W	26.01'
W5-719	S10°53'29"W	26.27'
W5-720	S01°36'29"W	51.71'
W5-721	S06°18'11"W	65.13'
W5-722	S11°02'06"W	25.91'
W5-723	S21°00'52"W	26.02'
W5-724	S30°51'59"W	52.25'
W5-725	S42°12'02"W	65.21'
W5-726	S13°14'55"W	91.04'
W5-727	S22°12'42"W	26.23'
W5-728	S34°46'39"W	65.11'
W5-729	S40°53'21"W	26.24'
W5-730	S46°25'06"W	26.10'
W5-731	S51°15'31"W	65.43'
W5-732	S62°44'28"W	13.23'
W5-733	N89°21'45"W	26.60'
W5-734	S82°34'50"W	12.99'
W5-735	S74°49'49"W	13.37'
W5-736	S64°49'07"W	37.91'
W5-737	N43°11'05"W	16.72'
W5-738	S63°35'42"W	192.69'
W5-739	N33°54'44"W	255.46'
W5-740	N36°35'55"W	348.15'
W5-741	N62°58'57"W	399.02'
W5-742	S87°44'58"W	188.85'
W5-743	N41°11'54"W	937.07'
W5-744	N57°17'59"W	441.08'
W5-745	N19°41'25"W	296.50'
W5-746	N31°43'40"W	901.34'
W5-747	N48°42'45"W	547.18'
W5-748	N23°55'07"W	1794.93'
W5-749	N38°53'43"W	169.57'
W5-750	N04°07'11"E	307.74'
W5-751	N21°37'09"W	126.33'
W5-752	N02°10'57"E	3190.64'
W5-753	N48°53'11"E	126.51'
W5-754	N21°49'59"E	298.44'
W5-755	N05°13'13"W	420.75'
W5-756	N29°34'54"E	366.71'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-757	N79°27'50"E	84.05'
W5-758	N57°40'00"E	243.15'
W5-759	N17°39'29"E	345.11'
W5-760	N00°57'03"W	1362.14'
W5-761	N45°58'37"E	197.36'
W5-762	N08°45'06"E	228.14'
W5-763	N12°50'02"W	447.27'
W5-764	N49°15'33"E	222.52'
W5-765	N12°52'54"E	187.19'
W5-766	N03°41'39"W	559.94'
W5-767	N19°46'00"W	181.66'
W5-768	N57°51'27"W	667.79'
W5-769	S81°28'27"W	177.99'
W5-770	N41°55'57"W	513.02'
W5-771	N58°54'00"W	179.07'
W5-772	N74°44'14"W	759.93'
W5-773	N57°48'37"W	330.32'
W5-774	S89°34'04"W	813.17'
W5-775	N79°17'07"W	518.40'
W5-776	N29°36'29"W	1828.17'
W5-777	N43°32'57"W	304.82'
W5-778	N64°34'13"W	171.48'
W5-779	N32°42'12"W	656.28'
W5-780	N49°50'05"W	193.28'
W5-781	N86°32'12"W	274.16'
W5-782	N24°12'24"E	162.36'
W5-783	N05°10'33"W	170.11'
W5-784	N31°51'09"W	132.20'
W5-785	N08°59'38"E	115.67'
W5-786	N12°18'19"W	153.14'
W5-787	N46°03'35"W	226.95'
W5-788	N32°30'52"E	163.93'
W5-789	N01°45'33"E	183.81'
W5-790	N31°30'48"W	704.20'
W5-791	N60°08'54"W	1065.52'
W5-792	N60°38'29"W	176.94'
W5-793	N30°34'08"W	1017.52'
W5-794	N01°23'47"W	460.21'
W5-795	N20°49'18"W	462.72'
W5-796	N23°08'06"W	442.17'
W5-797	N41°15'31"W	204.11'
W5-798	N74°40'25"W	648.52'
W5-799	S72°47'22"W	505.59'
W5-800	S89°04'21"W	277.22'
W5-801	S55°18'59"W	178.61'
W5-802	S39°29'43"W	440.23'
W5-803	N60°31'56"W	130.39'
W5-804	N16°11'22"E	296.03'
W5-805	N03°40'28"W	513.01'
W5-806	N12°32'51"W	312.26'
W5-807	N28°07'30"E	64.32'
W5-808	N11°35'27"E	151.35'
W5-809	N19°13'09"W	361.54'
W5-810	N41°08'58"W	209.83'
W5-811	N66°37'21"W	289.06'
W5-812	S75°00'00"W	210.92'
W5-813	S35°39'26"W	230.79'
W5-814	S11°43'04"W	193.14'
W5-815	N79°16'41"W	366.23'
W5-816	N41°15'00"E	128.01'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-817	S87°38'47"E	50.38'
W5-818	N60°00'00"E	128.01'
W5-819	N30°00'00"E	210.92'
W5-820	N05°37'30"W	190.47'
W5-821	N37°12'02"W	520.84'
W5-822	N65°39'29"W	364.01'
W5-823	S76°52'30"W	149.00'
W5-824	S38°09'32"W	198.12'
W5-825	S54°22'30"W	231.13'
W5-826	N52°39'25"W	416.95'
W5-827	N59°59'22"W	397.97'
W5-828	N85°32'16"W	169.71'
W5-829	N53°10'45"W	260.51'
W5-830	N72°11'11"W	81.30'
W5-831	N30°02'55"E	498.11'
W5-832	N13°22'58"E	188.18'
W5-833	N14°50'40"W	455.07'
W5-834	N46°58'20"W	500.06'
W5-835	N68°44'27"W	315.32'
W5-836	N44°26'39"W	291.91'
W5-837	N79°47'39"W	212.66'
W5-838	S63°21'16"W	338.35'
W5-839	S40°21'58"W	109.54'
W5-840	N30°29'45"W	166.71'
W5-841	N45°08'16"W	165.86'
W5-842	N71°38'40"W	160.55'
W5-843	N06°54'03"W	174.91'
W5-844	N23°04'27"W	146.55'
W5-845	N49°54'57"W	477.18'
W5-846	N64°45'04"W	165.51'
W5-847	N26°14'40"W	281.92'
W5-848	N19°13'10"E	169.01'
W5-849	N17°41'15"W	245.57'
W5-850	N54°54'35"W	489.18'
W5-851	N89°31'12"W	797.35'
W5-852	S53°12'56"W	240.69'
W5-853	S13°54'24"W	409.28'
W5-854	S68°27'32"W	320.65'
W5-855	N18°30'35"W	362.78'
W5-856	N43°18'33"W	513.93'
W5-857	N62°15'38"W	71.25'
W5-858	S89°57'35"W	935.61'
W5-859	N68°37'27"W	144.50'
W5-860	N18°26'08"E	379.94'
W5-861	N20°19'37"W	529.60'
W5-862	N62°02'05"W	429.08'
W5-863	N86°32'15"W	267.13'
W5-864	S75°32'41"W	202.27'
W5-865	N46°10'56"W	417.30'
W5-866	S86°46'20"W	367.96'
W5-867	S52°30'00"W	169.83'
W5-868	N74°35'50"W	259.23'
W5-869	N84°18'14"W	487.97'
W5-870	S64°45'17"W	822.53'
W5-871	S38°40'15"W	219.65'
W5-872	N57°44'23"W	497.37'
W5-873	N75°48'07"W	358.34'
W5-874	N53°46'41"W	354.45'
W5-875	N85°56'15"W	275.00'
W5-876	S78°46'48"W	150.06'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-877	S49°47'00"W	543.10'
W5-878	S20°56'49"W	178.67'
W5-879	N80°05'14"W	76.08'
W5-880	N29°14'33"W	110.11'
W5-881	N51°12'28"W	200.82'
W5-882	N27°02'52"E	35.05'
W5-883	N59°30'52"E	238.11'
W5-884	N35°03'24"E	146.67'
W5-885	N56°16'25"E	136.51'
W5-886	N27°31'21"E	75.55'
W5-887	N46°06'42"E	41.62'
W5-888	N15°22'08"E	254.47'
W5-889	N44°27'31"W	377.61'
W5-890	N06°06'27"E	95.79'
W5-891	N16°38'13"E	213.43'
W5-892	N42°30'49"E	85.84'
W5-893	N24°46'38"E	113.24'
W5-894	N15°18'44"E	196.06'
W5-895	N37°25'13"E	257.53'
W5-896	N02°21'57"E	699.86'
W5-897	N46°08'11"W	67.13'
W5-898	N57°12'08"E	74.35'
W5-899	N42°42'58"E	435.59'
W5-900	N24°31'09"E	126.00'
W5-901	S59°37'17"E	63.56'
W5-902	N30°22'45"E	18.58'
W5-903	N16°03'28"W	29.42'
W5-904	N61°06'07"W	205.19'
W5-905	N66°12'49"W	241.99'
W5-906	N76°43'08"W	241.04'
W5-907	N08°11'13"E	37.23'
W5-908	S88°16'12"E	1407.24'
W5-909	S26°59'25"W	140.05'
W5-910	S63°00'35"E	106.43'
W5-911	S53°15'52"E	42.87'
W5-912	S67°18'52"E	237.75'
W5-913	S11°16'20"W	16.11'
W5-914	S26°49'42"E	363.82'
W5-915	S40°11'12"E	31.43'
W5-916	S81°02'09"E	18.46'
W5-917	S88°26'09"E	68.20'
W5-918	S44°08'15"E	376.92'
W5-919	S87°54'22"E	68.34'
W5-920	N86°08'57"E	245.26'
W5-921	N86°08'36"E	701.88'
W5-922	N84°00'43"E	423.17'
W5-923	N55°20'09"E	327.90'
W5-924	N28°19'08"E	278.17'
W5-925	N00°00'02"E	261.94'
W5-926	N22°27'12"W	268.34'
W5-927	S85°20'32"E	323.76'
W5-928	S58°07'02"E	242.36'
W5-929	S79°23'31"E	139.17'
W5-930	S07°57'44"W	323.66'
W5-931	S24°28'52"E	305.60'
W5-932	S55°37'43"E	298.10'
W5-933	S88°03'17"E	1696.26'
W5-934	N74°20'36"E	205.24'
W5-935	S77°56'42"E	506.78'
W5-936	N89°27'56"E	1045.60'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-937	N68°13'10"E	342.68'
W5-938	N40°22'10"E	271.03'
W5-939	N65°35'24"E	94.51'
W5-940	S75°12'44"E	363.85'
W5-941	N70°18'34"E	208.13'
W5-942	N30°13'30"E	713.23'
W5-943	N11°20'54"W	243.77'
W5-944	N38°12'03"W	433.47'
W5-945	N82°13'26"W	242.28'
W5-946	N01°13'29"W	97.13'
W5-947	N24°22'21"E	279.80'
W5-948	N03°12'48"E	236.61'
W5-949	N57°59'46"E	312.04'
W5-950	N22°19'00"E	286.52'
W5-951	N21°46'54"W	555.04'
W5-952	N71°30'41"W	564.72'
W5-953	N61°40'20"W	476.74'
W5-954	S86°22'12"W	272.36'
W5-955	N63°07'08"W	339.75'
W5-956	S88°36'37"W	535.96'
W5-957	N14°46'06"W	156.50'
W5-958	N42°41'00"W	345.16'
W5-959	N12°45'14"W	139.10'
W5-960	N40°54'30"W	210.15'
W5-961	N05°21'03"W	222.23'
W5-962	N48°28'31"W	304.44'
W5-963	N12°57'29"W	260.65'
W5-964	N66°38'59"E	207.91'
W5-965	N59°15'20"E	342.56'
W5-966	N25°55'14"E	157.58'
W5-967	N12°01'29"E	300.20'
W5-968	N04°16'08"E	295.70'
W5-969	N27°28'56"W	256.08'
W5-970	N38°57'22"W	289.55'
W5-971	N75°58'46"W	170.98'
W5-972	S66°41'16"W	108.18'
W5-973	N01°56'25"W	299.33'
W5-974	N20°10'39"E	191.01'
W5-975	N11°44'13"W	442.95'
W5-976	N40°58'45"W	523.16'
W5-977	N51°06'54"W	538.67'
W5-978	N68°46'23"W	390.87'
W5-979	N33°02'55"W	223.05'
W5-980	N00°04'08"W	1018.37'
W5-981	N00°13'27"W	816.07'
W5-982	N50°27'30"E	759.26'
W5-983	N62°44'59"E	434.56'
W5-984	S83°43'38"E	473.55'
W5-985	S59°45'35"E	456.55'
W5-986	S88°44'28"E	289.39'
W5-987	N54°56'58"E	251.40'
W5-988	N22°04'51"E	1278.30'
W5-989	N06°08'48"W	567.50'
W5-990	N55°40'39"W	574.00'
W5-991	N71°03'20"W	552.40'
W5-992	N54°35'22"W	1184.35'
W5-993	N27°50'48"W	147.34'
W5-994	N01°03'04"E	120.74'
W5-995	N07°30'50"W	1024.64'
W5-996	N27°25'18"W	296.56'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-997	N08°45'46"W	201.85'
W5-998	N32°23'58"W	650.63'
W5-999	N16°28'17"W	318.21'
W5-1000	N37°31'57"W	815.22'
W5-1001	N51°40'46"E	304.64'
W5-1002	N14°15'08"E	185.61'
W5-1003	N02°10'45"W	138.04'
W5-1004	N35°26'01"E	231.73'
W5-1005	N03°33'37"E	329.35'
W5-1006	N32°22'19"W	356.98'
W5-1007	N74°34'45"W	372.67'
W5-1008	S75°31'17"W	316.74'
W5-1009	S40°08'16"W	308.67'
W5-1010	S76°26'40"W	183.04'
W5-1011	N66°50'36"W	278.24'
W5-1012	N49°51'37"W	161.64'
W5-1013	N28°59'36"W	299.28'
W5-1014	N48°27'31"W	344.66'
W5-1015	N13°50'41"W	352.11'
W5-1016	N35°01'43"W	549.61'
W5-1017	N56°50'41"W	245.94'
W5-1018	N38°34'28"W	299.20'
W5-1019	N73°04'52"W	360.78'
W5-1020	N13°10'17"E	527.92'
W5-1021	S74°13'30"E	521.27'
W5-1022	N73°29'19"E	434.45'
W5-1023	S80°48'50"E	264.36'
W5-1024	N64°35'17"E	606.20'
W5-1025	N23°38'54"E	402.76'
W5-1026	N13°44'46"W	555.74'
W5-1027	N40°45'50"W	638.23'
W5-1028	N00°02'51"W	127.57'
W5-1029	N20°04'44"W	248.48'
W5-1030	N28°55'49"E	651.26'
W5-1031	N14°44'33"E	160.82'
W5-1032	N16°16'30"W	834.13'
W5-1033	N54°57'18"W	569.63'
W5-1034	N01°10'13"E	144.61'
W5-1035	N28°43'22"W	731.41'
W5-1036	N62°51'28"W	451.87'
W5-1037	N42°28'12"W	188.34'
W5-1038	N66°54'40"W	161.33'
W5-1039	N33°34'28"W	133.33'
W5-1040	N24°53'01"E	528.30'
W5-1041	N00°00'36"W	216.86'
W5-1042	N25°51'08"E	169.57'
W5-1043	N05°38'15"E	226.73'
W5-1044	N16°26'49"W	269.40'
W5-1045	N43°12'33"W	325.43'
W5-1046	N07°34'41"E	545.08'
W5-1047	N07°52'50"W	369.07'
W5-1048	N31°55'51"W	113.84'
W5-1049	N86°33'33"E	378.71'
W5-1050	N65°39'59"E	221.97'
W5-1051	N32°39'04"E	303.95'
W5-1052	N67°05'00"E	391.98'
W5-1053	N46°55'01"E	603.58'
W5-1054	N27°49'43"E	400.50'
W5-1055	N71°58'27"E	507.51'
W5-1056	S81°10'10"E	675.44'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1057	N77°44'53"E	450.85'
W5-1058	S58°33'10"E	62.28'
W5-1059	S27°07'57"E	537.80'
W5-1060	S48°55'12"E	243.55'
W5-1061	N77°01'09"E	350.37'
W5-1062	N22°29'33"E	378.45'
W5-1063	N20°17'07"W	541.63'
W5-1064	N47°47'34"E	256.63'
W5-1065	N04°38'01"E	435.81'
W5-1066	N26°43'46"W	401.02'
W5-1067	N65°43'12"W	521.01'
W5-1068	S89°31'54"W	1574.86'
W5-1069	S70°04'16"W	841.80'
W5-1070	N88°24'56"W	665.36'
W5-1071	S73°07'58"W	207.68'
W5-1072	S54°40'53"W	310.44'
W5-1073	N78°46'33"W	146.05'
W5-1074	S84°25'48"W	189.59'
W5-1075	S67°38'09"W	429.19'
W5-1076	S88°04'05"W	376.89'
W5-1077	S73°56'55"W	160.07'
W5-1078	S45°30'46"W	1047.86'
W5-1079	S12°44'29"W	449.77'
W5-1080	S02°56'05"E	147.90'
W5-1081	S33°43'14"E	320.68'
W5-1082	S56°13'02"E	109.98'
W5-1083	S71°44'08"W	270.30'
W5-1084	N24°21'42"W	124.19'
W5-1085	N47°14'02"W	419.66'
W5-1086	N65°19'49"W	191.11'
W5-1087	S85°24'20"W	503.24'
W5-1088	N76°22'24"W	431.18'
W5-1089	N62°57'40"W	502.44'
W5-1090	S88°41'12"W	1254.06'
W5-1091	S68°07'32"W	142.13'
W5-1092	S55°59'17"W	328.58'
W5-1093	N37°08'48"W	150.34'
W5-1094	N56°59'29"W	447.36'
W5-1095	N00°12'51"W	212.58'
W5-1096	N09°21'29"E	109.52'
W5-1097	N27°50'08"E	111.56'
W5-1098	S74°12'34"E	8.86'
W5-1099	N32°39'33"E	173.37'
W5-1100	S79°08'29"E	31.90'
W5-1101	N32°24'42"E	116.05'
W5-1102	N33°01'59"W	65.96'
W5-1103	N32°24'45"E	120.27'
W5-1104	S87°22'16"E	43.33'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1105	N80°46'45"E	47.72'
W5-1106	N11°42'39"E	63.31'
W5-1107	N02°27'43"W	69.83'
W5-1108	N75°29'02"W	61.52'
W5-1109	N81°47'29"W	36.59'
W5-1110	N28°33'42"W	494.76'
W5-1111	N05°52'56"W	177.63'
W5-1112	N84°12'44"W	82.96'
W5-1113	N28°33'44"W	228.37'
W5-1114	N37°57'18"E	30.45'
W5-1115	N11°52'19"E	70.17'
W5-1116	N39°54'23"W	75.64'
W5-1117	N24°25'16"W	24.64'
W5-1118	N39°48'22"W	49.11'
W5-1119	N79°24'23"W	9.84'
W5-1120	N28°53'17"W	89.54'
W5-1121	N13°51'35"E	11.78'
W5-1122	N41°34'38"W	84.74'
W5-1123	N47°39'04"W	36.09'
W5-1124	N28°43'47"E	8.95'
W5-1125	N15°34'22"W	65.40'
W5-1126	N28°00'49"W	66.96'
W5-1127	N77°44'25"W	7.43'
W5-1128	N25°02'30"W	93.45'
W5-1129	N16°43'04"E	24.45'
W5-1130	N49°27'20"W	82.06'
W5-1131	S24°55'42"W	58.74'
W5-1132	S63°05'58"W	11.00'
W5-1133	S26°54'05"E	22.22'
W5-1134	S51°16'15"W	413.55'
W5-1135	N39°26'11"W	400.94'
W5-1136	N19°03'58"E	336.02'
W5-1137	N36°34'48"E	357.02'
W5-1138	N06°07'14"W	518.21'
W5-1139	N31°12'37"W	130.18'
W5-1140	N59°47'34"W	716.68'
W5-1141	N39°00'00"E	652.46'
W5-1142	S14°14'10"E	8.42'
W5-1143	N75°45'52"E	29.97'
W5-1144	N01°15'28"E	23.35'
W5-1145	N75°44'22"E	23.78'
W5-1146	N14°15'37"W	30.72'
W5-1147	N38°59'59"E	105.52'
W5-1148	N51°59'08"W	421.97'
W5-1149	N76°00'28"W	5.59'
W5-1150	N46°33'37"E	2.81'
W5-1151	N46°37'43"E	553.19'
W5-1152	S43°51'45"E	45.71'

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W-5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

****

SCALE: NO SCALE FEBRUARY, 2020

BY: TOWILL Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 16 OF 21

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1153	N46°59'13"E	60.00'
W5-1154	N43°52'19"W	46.08'
W5-1155	N46°52'34"E	1493.85'
W5-1156	N24°05'25"W	635.06'
W5-1157	N56°34'09"E	65.87'
W5-1158	N24°05'12"W	101.79'
W5-1159	N56°33'44"E	55.12'
W5-1160	N33°26'16"W	18.45'
W5-1161	S88°38'30"W	61.49'
W5-1162	S29°35'48"W	40.34'
W5-1163	N49°31'45"W	694.02'
W5-1164	N45°01'07"W	36.34'
W5-1165	N53°39'58"W	41.98'
W5-1166	N23°39'04"W	384.29'
W5-1167	N15°09'33"E	49.27'
W5-1168	N04°58'45"E	17.81'
W5-1169	N52°59'24"W	30.85'
W5-1170	N63°01'13"W	38.30'
W5-1171	N23°39'08"W	14.35'
W5-1172	N17°34'19"E	41.73'
W5-1173	N23°39'09"W	67.69'
W5-1174	N81°31'20"W	32.47'
W5-1175	N23°39'01"W	42.96'
W5-1176	N29°43'57"E	15.50'
W5-1177	N44°08'28"E	29.45'
W5-1178	N21°17'57"E	31.86'
W5-1179	N23°45'37"W	14.46'
W5-1180	S66°14'23"W	37.51'
W5-1181	N08°14'14"E	950.78'
W5-1182	N26°16'25"E	549.43'
W5-1183	N02°56'07"W	313.41'
W5-1184	N27°11'56"W	224.87'
W5-1185	N65°33'39"W	521.94'
W5-1186	S66°32'04"W	325.21'
W5-1187	N66°37'24"W	312.44'
W5-1188	S65°26'07"W	244.06'
W5-1189	S30°47'24"W	385.64'
W5-1190	S76°57'24"W	341.46'
W5-1191	S41°12'21"W	293.61'
W5-1192	S74°22'53"W	376.32'
W5-1193	S44°00'42"W	305.20'
W5-1194	N80°20'15"W	127.25'
W5-1195	S75°09'57"W	150.85'
W5-1196	S47°11'32"W	548.83'
W5-1197	N26°43'39"W	223.54'
W5-1198	N46°40'18"W	148.61'
W5-1199	N08°14'30"W	312.59'
W5-1200	N45°26'50"W	308.79'
W5-1201	N03°01'11"W	349.29'
W5-1202	N27°37'51"W	296.22'
W5-1203	N48°25'23"W	378.93'
W5-1204	N71°52'51"W	122.91'
W5-1205	N02°11'34"E	241.42'
W5-1206	N11°25'21"W	154.46'
W5-1207	N37°48'05"W	501.51'
W5-1208	N02°36'15"W	351.85'
W5-1209	N30°37'01"W	454.72'
W5-1210	N00°14'16"W	182.10'
W5-1211	N28°57'53"W	142.91'
W5-1212	N05°05'47"E	62.48'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1213	N48°57'18"E	331.95'
W5-1214	N22°23'34"E	673.02'
W5-1215	N05°18'49"W	126.58'
W5-1216	N32°23'01"W	333.92'
W5-1217	N04°16'39"E	167.12'
W5-1218	N68°32'03"E	248.69'
W5-1219	N31°56'27"E	477.11'
W5-1220	N04°10'04"E	780.24'
W5-1221	N14°15'56"W	464.76'
W5-1222	N60°39'03"W	583.37'
W5-1223	S83°10'36"W	669.98'
W5-1224	S46°17'28"W	435.70'
W5-1225	N89°03'25"W	260.05'
W5-1226	S74°33'50"W	185.03'
W5-1227	S57°20'07"W	313.30'
W5-1228	S33°30'04"W	170.18'
W5-1229	S03°05'42"W	420.08'
W5-1230	N73°11'23"W	462.24'
W5-1231	S67°53'29"W	441.47'
W5-1232	S27°57'55"W	422.03'
W5-1233	S00°42'13"W	460.00'
W5-1234	S19°32'02"E	600.25'
W5-1235	S26°55'16"W	69.54'
W5-1236	N28°37'56"W	211.82'
W5-1237	N58°03'09"W	192.63'
W5-1238	N75°07'26"W	215.29'
W5-1239	N16°57'13"W	203.43'
W5-1240	N34°46'52"W	200.59'
W5-1241	N72°50'22"W	227.20'
W5-1242	S68°42'40"W	310.81'
W5-1243	N86°50'15"W	141.74'
W5-1244	N06°24'31"W	502.66'
W5-1245	N41°15'24"W	402.88'
W5-1246	N21°15'31"E	277.48'
W5-1247	N14°50'08"W	256.74'
W5-1248	N58°42'02"E	258.50'
W5-1249	N31°16'20"E	200.82'
W5-1250	N17°02'54"E	140.41'
W5-1251	N06°05'16"W	186.98'
W5-1252	S83°51'25"E	209.00'
W5-1253	S42°51'48"E	307.49'
W5-1254	S86°30'38"E	366.62'
W5-1255	N64°26'42"E	484.21'
W5-1256	N34°49'02"E	697.06'
W5-1257	N33°46'29"E	299.96'
W5-1258	S83°45'50"E	240.77'
W5-1259	S87°00'08"E	126.53'
W5-1260	N76°50'21"E	124.50'
W5-1261	S59°58'47"E	518.90'
W5-1262	S84°50'34"E	1045.84'
W5-1263	N85°58'38"E	1297.37'
W5-1264	N80°45'41"E	425.47'
W5-1265	N80°45'41"E	1162.38'
W5-1266	N66°06'29"E	1559.35'
W5-1267	N43°43'35"E	1140.17'
W5-1268	N43°43'34"E	173.75'
W5-1269	N43°38'48"E	196.37'
W5-1270	N43°38'49"E	1486.62'
W5-1271	N44°26'10"E	1387.22'
W5-1272	N40°47'20"E	1128.87'

W-5 LINE TABLE

LINE	BEARING	DISTANCE
W5-1273	N40°47'20"E	781.27'
W5-1274	N46°16'53"E	1342.78'
W5-1275	N44°45'33"E	225.80'
W5-1276	N44°45'32"E	1142.43'
W5-1277	N44°45'27"E	5.76'
W5-1278	N44°45'32"E	514.80'
W5-1279	N42°47'47"E	296.10'

RECORD OF SURVEY NO. ____

****

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W-5

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

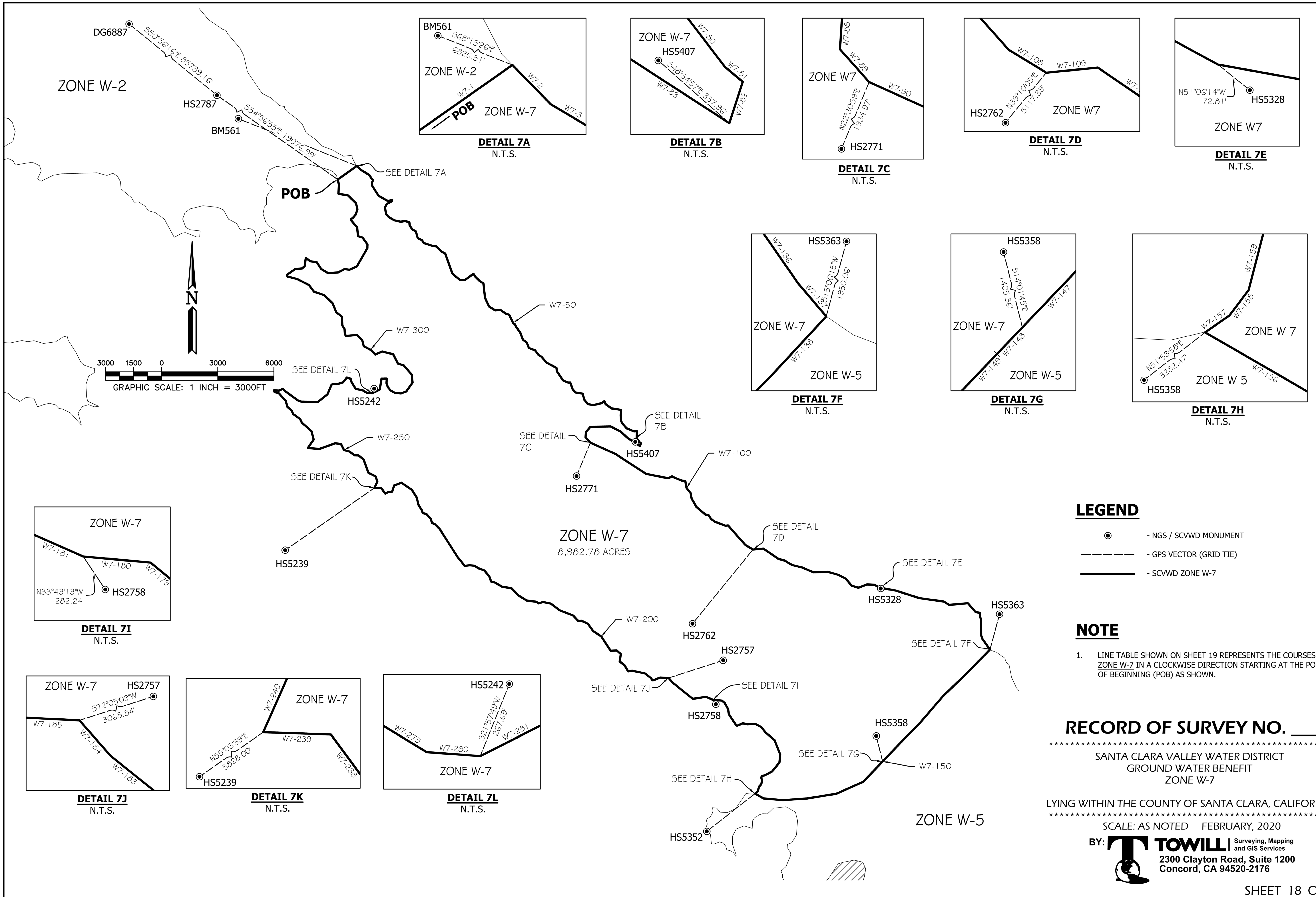
****

SCALE: NO SCALE   FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

SHEET 17 OF 21



DETAIL 7A
N.T.S.

DETAIL 7B
N.T.S.

DETAIL 7C
N.T.S.

DETAIL 7D
N.T.S.

DETAIL 7E
N.T.S.

DETAIL 7F
N.T.S.

DETAIL 7G
N.T.S.

DETAIL 7H
N.T.S.

DETAIL 7I
N.T.S.

DETAIL 7J
N.T.S.

DETAIL 7K
N.T.S.

DETAIL 7L
N.T.S.

LEGEND

⊙ - NGS / SCVWD MONUMENT

– – – – – - GPS VECTOR (GRID TIE)

━━━ - SCVWD ZONE W-7

NOTE

1. LINE TABLE SHOWN ON SHEET 19 REPRESENTS THE COURSES OF ZONE W-7 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN.

RECORD OF SURVEY NO. ____

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W-7

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

BY: TOWILL Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

W-7 LINE TABLE

LINE	BEARING	DISTANCE
W7-1	N54°53'58"E	1256.28'
W7-2	S44°19'07"E	293.80'
W7-3	S59°19'19"E	534.65'
W7-4	S31°06'28"E	251.83'
W7-5	S55°57'14"E	84.57'
W7-6	S22°30'00"W	169.83'
W7-7	S07°30'00"E	169.83'
W7-8	S32°28'51"E	615.92'
W7-9	S60°15'39"E	512.26'
W7-10	S80°37'30"E	106.89'
W7-11	N73°07'30"E	190.48'
W7-12	S07°35'47"W	74.24'
W7-13	S61°58'08"W	314.50'
W7-14	S28°52'44"W	214.95'
W7-15	S10°31'18"E	372.71'
W7-16	S41°47'17"E	202.66'
W7-17	S59°46'44"E	339.98'
W7-18	S77°14'15"E	363.55'
W7-19	N79°27'27"E	223.54'
W7-20	S73°39'04"E	250.80'
W7-21	S03°45'00"E	169.83'
W7-22	S35°53'04"E	262.31'
W7-23	S60°05'41"E	209.89'
W7-24	S14°41'16"E	308.36'
W7-25	S41°15'00"E	128.01'
W7-26	S67°30'00"E	169.83'
W7-27	S31°46'20"E	192.49'
W7-28	S72°04'06"E	441.19'
W7-29	S79°42'56"E	251.00'
W7-30	S45°27'21"E	399.21'
W7-31	S64°22'51"E	212.69'
W7-32	S19°36'50"E	1119.13'
W7-33	S43°57'50"E	163.80'
W7-34	S51°22'55"E	397.19'
W7-35	S89°58'05"E	254.17'
W7-36	N54°36'21"E	568.05'
W7-37	S32°32'22"E	194.40'
W7-38	S45°34'26"E	341.04'
W7-39	S60°26'54"E	207.97'
W7-40	S06°11'17"E	786.96'
W7-41	S25°26'20"E	518.80'
W7-42	S58°35'01"E	388.62'
W7-43	N82°38'42"E	265.42'
W7-44	S55°03'01"E	348.77'
W7-45	S70°23'31"E	203.40'
W7-46	S25°15'43"E	487.77'
W7-47	S52°56'13"E	128.63'
W7-48	S24°17'34"E	134.85'
W7-49	S36°10'07"E	376.86'
W7-50	S20°43'22"E	416.69'
W7-51	S53°16'53"E	251.30'
W7-52	S21°33'28"E	312.80'
W7-53	S68°22'15"E	356.78'
W7-54	S37°31'38"E	318.11'
W7-55	S62°19'49"E	157.31'
W7-56	S40°51'45"E	434.63'
W7-57	S61°59'11"E	596.20'
W7-58	S06°51'24"E	185.57'
W7-59	S33°58'15"E	580.77'
W7-60	S67°41'19"E	303.90'
W7-61	S88°52'29"E	109.29'
W7-62	S19°43'55"E	386.22'
W7-63	S42°58'34"E	231.58'
W7-64	S80°38'19"E	382.19'
W7-65	S14°28'06"E	330.79'
W7-66	S39°25'48"E	295.69'
W7-67	S76°47'33"E	285.66'
W7-68	N76°48'37"E	487.63'
W7-69	N52°16'44"E	170.48'
W7-70	S22°32'07"E	167.73'
W7-71	S53°50'13"E	385.28'
W7-72	S80°36'55"E	531.67'
W7-73	S05°43'30"W	272.29'
W7-74	S02°26'27"E	264.72'
W7-75	S18°13'19"E	178.45'
W7-76	S41°45'59"E	373.88'
W7-77	S67°47'03"E	429.30'
W7-78	N85°06'38"E	151.00'
W7-79	S01°07'18"W	388.26'
W7-80	S37°18'29"E	267.26'
W7-81	S50°08'27"E	82.99'
W7-82	S17°54'43"W	155.10'
W7-83	N57°04'36"W	778.57'
W7-84	N46°55'02"W	512.47'
W7-85	N63°09'45"W	614.85'
W7-86	S88°35'03"W	1078.66'
W7-87	S41°44'00"W	361.95'
W7-88	S03°36'31"W	282.81'
W7-89	S41°35'28"E	391.19'
W7-90	S65°42'13"E	1480.73'
W7-91	S56°57'12"E	1945.58'
W7-92	S78°41'12"E	1205.08'
W7-93	N62°53'28"E	227.67'
W7-94	S63°06'55"E	203.67'
W7-95	S68°36'09"E	395.81'
W7-96	S82°57'53"E	162.76'
W7-97	S10°16'12"E	369.73'
W7-98	S38°41'58"E	345.02'
W7-99	S10°37'27"E	302.67'
W7-100	S29°53'09"E	515.16'
W7-101	S49°40'46"E	629.01'
W7-102	S80°18'50"E	169.28'
W7-103	S33°08'30"E	230.52'
W7-104	S50°53'56"E	244.82'
W7-105	S69°20'31"E	634.18'
W7-106	N82°37'57"E	135.78'
W7-107	S41°34'43"E	1400.71'
W7-108	S58°37'51"E	471.89'
W7-109	N84°21'03"E	554.02'
W7-110	S55°40'57"E	982.19'
W7-111	S75°31'52"E	351.76'
W7-112	S57°35'02"E	269.63'
W7-113	S62°22'44"E	215.77'
W7-114	S76°40'14"E	503.57'
W7-115	S66°51'03"E	677.16'
W7-116	N88°19'34"E	773.62'
W7-117	S74°10'10"E	573.92'
W7-118	S62°45'18"E	448.80'
W7-119	S40°06'35"E	483.15'
W7-120	S72°09'26"E	380.44'
W7-121	N69°45'24"E	504.45'
W7-122	S87°20'54"E	392.76'
W7-123	S61°28'19"E	316.66'
W7-124	S79°48'21"E	871.35'
W7-125	S72°12'13"E	1340.62'
W7-126	S82°05'34"E	1307.58'
W7-127	S57°33'16"E	343.06'
W7-128	N84°35'08"E	1001.65'
W7-129	S41°21'42"E	624.98'
W7-130	S78°53'17"E	225.22'
W7-131	S04°29'59"E	220.18'
W7-132	S24°08'55"E	130.72'
W7-133	S00°28'16"E	431.13'
W7-134	S00°28'16"E	426.84'
W7-135	S17°37'10"E	193.47'
W7-136	S34°46'04"E	558.43'
W7-137	S40°26'42"E	153.60'
W7-138	S42°47'47"W	296.10'
W7-139	S44°45'32"W	514.80'
W7-140	S44°45'27"W	5.76'
W7-141	S44°45'32"W	1142.43'
W7-142	S44°45'33"W	225.80'
W7-143	S46°16'53"W	1342.78'
W7-144	S40°47'20"W	781.27'
W7-145	S40°47'20"W	1128.87'
W7-146	S44°26'10"W	1387.22'
W7-147	S43°38'49"W	1486.62'
W7-148	S43°38'48"W	196.37'
W7-149	S43°43'34"W	173.75'
W7-150	S43°43'35"W	1140.17'
W7-151	S66°06'29"W	1559.35'
W7-152	S80°45'41"W	1162.38'
W7-153	S80°45'41"W	425.47'
W7-154	S85°58'38"W	1297.37'
W7-155	N84°50'34"W	1045.84'
W7-156	N59°58'47"W	516.91'
W7-157	N55°16'53"E	105.00'
W7-158	N37°08'25"E	114.36'
W7-159	N14°29'09"E	224.01'
W7-160	N43°18'37"E	164.99'
W7-161	N14°07'14"E	206.51'
W7-162	N15°27'02"W	164.91'
W7-163	N19°27'09"E	103.46'
W7-164	N79°26'13"E	152.36'
W7-165	N61°55'00"E	443.86'
W7-166	N39°27'07"E	621.89'
W7-167	N05°33'37"E	431.95'
W7-168	N21°26'48"W	827.64'
W7-169	N50°03'05"W	631.42'
W7-170	N37°58'40"W	372.88'
W7-171	N62°27'17"W	356.45'
W7-172	S87°11'31"W	413.86'
W7-173	N78°28'35"W	265.44'
W7-174	S66°18'03"W	331.51'
W7-175	N51°55'40"W	68.51'
W7-176	N33°36'11"W	696.42'
W7-177	N08°08'10"W	269.16'
W7-178	N28°53'54"W	383.26'
W7-179	N50°26'27"W	191.24'
W7-180	N84°57'23"W	481.28'
W7-181	N66°03'24"W	403.06'
W7-182	S81°01'42"W	715.14'
W7-183	N51°14'03"W	1376.69'
W7-184	N41°18'00"W	338.67'
W7-185	N87°04'43"W	450.27'
W7-186	S68°03'55"W	400.47'
W7-187	N88°51'51"W	52.98'
W7-188	N26°35'16"W	126.06'
W7-189	N51°54'17"W	421.26'
W7-190	N78°06'59"W	698.20'
W7-191	S81°21'45"W	218.91'
W7-192	N30°56'20"W	393.03'
W7-193	N53°33'26"W	312.64'
W7-194	N09°08'29"E	399.49'
W7-195	N48°01'42"W	297.75'
W7-196	S87°07'56"W	327.63'
W7-197	N32°58'01"W	913.88'
W7-198	N56°51'21"W	522.08'
W7-199	N35°36'37"W	478.70'
W7-200	N64°09'48"W	371.05'
W7-201	S86°52'35"W	184.02'
W7-202	N43°07'11"W	406.11'
W7-203	N68°51'35"W	771.17'
W7-204	N53°15'54"W	592.46'
W7-205	N78°39'57"W	422.03'
W7-206	S72°38'19"W	243.19'
W7-207	N56°16'25"W	163.94'
W7-208	N83°07'00"W	496.93'
W7-209	N58°25'24"W	522.55'
W7-210	N43°49'44"W	532.45'
W7-211	N79°54'55"W	528.35'
W7-212	N60°13'53"W	443.29'
W7-213	N77°49'40"W	198.37'
W7-214	N18°48'11"W	300.29'
W7-215	N40°04'40"W	416.35'
W7-216	N69°38'48"W	344.42'
W7-217	N55°37'38"W	231.08'
W7-218	N83°53'04"W	266.52'
W7-219	S82°23'35"W	278.03'
W7-220	N36°21'46"W	298.09'
W7-221	N40°47'43"W	279.55'
W7-222	N32°29'30"W	1436.66'
W7-223	N32°05'40"W	345.70'
W7-224	N44°43'46"W	386.94'
W7-225	N66°24'26"W	171.20'
W7-226	N15°02'02"W	222.69'
W7-227	N42°01'16"W	350.55'
W7-228	N75°50'41"W	205.38'
W7-229	N17°53'59"W	159.12'
W7-230	N31°58'07"W	354.34'
W7-231	N12°28'01"W	383.06'
W7-232	N32°01'02"W	494.10'
W7-233	N55°42'04"W	676.82'
W7-234	S69°19'02"W	417.44'
W7-235	S17°31'25"W	347.64'
W7-236	S82°21'42"W	232.61'
W7-237	S61°39'27"W	155.87'
W7-238	N36°20'46"W	366.09'
W7-239	N88°04'50"W	362.22'
W7-240	N23°55'46"E	377.69'
W7-241	N20°34'08"W	288.52'
W7-242	N63°21'42"W	422.14'
W7-243	N19°40'48"W	768.32'
W7-244	N52°34'45"W	341.88'
W7-245	N88°55'51"W	204.95'
W7-246	N54°03'52"W	352.74'
W7-247	N75°39'31"W	290.58'
W7-248	N26°53'46"W	359.93'
W7-249	N81°28'48"W	311.15'
W7-250	S70°12'47"W	906.90'
W7-251	N84°57'37"W	615.36'
W7-252	N34°35'30"E	551.21'
W7-253	N14°33'42"W	463.36'
W7-254	N48°50'16"W	685.74'
W7-255	N24°52'15"W	217.77'
W7-256	N54°25'46"W	465.76'
W7-257	N20°35'26"W	195.27'
W7-258	N49°39'27"W	301.52'
W7-259	N16°12'29"W	333.36'
W7-260	N42°11'13"W	554.91'
W7-261	N75°33'17"W	227.92'
W7-262	N16°21'14"W	101.00'
W7-263	S86°05'23"E	254.70'
W7-264	N64°42'25"E	239.18'
W7-265	S40°56'41"E	146.13'
W7-266	S53°51'05"E	876.36'
W7-267	S70°26'03"E	187.27'
W7-268	S88°21'17"E	887.00'
W7-269	N51°13'26"E	662.72'
W7-270	N22°43'37"E	556.78'
W7-271	N58°12'25"E	86.18'
W7-272	S86°25'17"E	215.65'
W7-273	N73°21'21"E	346.88'
W7-274	N38°07'25"E	327.37'
W7-275	S71°00'01"E	216.89'
W7-276	S11°36'51"E	147.75'
W7-277	S31°11'25"E	459.87'
W7-278	S79°02'48"E	369.71'
W7-279	S58°37'09"E	276.00'
W7-280	S85°50'40"E	286.95'
W7-281	N63°04'25"E	447.37'
W7-282	N09°43'39"E	586.03'
W7-283	N89°50'41"E	279.36'
W7-284	S04°11'06"W	235.20'
W7-285	S18°43'41"E	218.01'
W7-286	S38°08'00"E	239.76'
W7-287	S60°52'58"E	253.74'
W7-288	S83°38'32"E	340.71'
W7-289	N68°49'39"E	303.29'
W7-290	N35°12'53"E	579.74'
W7-291	N06°03'34"W	423.64'
W7-292	N40°52'06"W	662.31'
W7-293	N73°40'52"W	316.15'
W7-294	N26°48'29"W	563.70'
W7-295	N76°09'31"W	606.16'
W7-296	S66°42'30"W	401.43'
W7-297	N45°17'56"W	347.12'
W7-298	N61°42'56"W	420.33'
W7-299	N13°59'26"W	342.45'
W7-300	N46°39'12"W	389.34'
W7-301	S85°45'38"W	592.01'
W7-302	N27°08'34"W	128.07'
W7-303	N02°51'51"W	255.53'
W7-304	N32°36'07"W	215.66'
W7-305	N02°23'34"W	469.18'
W7-306	N51°33'40"W	392.73'
W7-307	N22°04'15"W	532.00'
W7-308	N47°24'54"W	622.30'
W7-309	N71°08'18"W	564.36'
W7-310	N36°45'37"W	451.48'
W7-311	N63°08'57"W	715.06'
W7-312	N76°09'21"W	523.11'
W7-313	N16°34'48"W	97.13'
W7-314	N54°56'08"E	349.80'
W7-315	N54°56'08"E	178.98'
W7-316	N83°58'41"E	383.01'
W7-317	N47°37'07"E	179.48'
W7-318	N07°57'28"E	446.34'
W7-319	S53°11'50"E	302.60'
W7-320	S81°53'02"E	346.55'
W7-321	S32°54'15"E	436.41'
W7-322	S59°06'59"E	435.74'
W7-323	N85°30'58"E	538.28'
W7-324	N62°13'52"E	377.76'
W7-325	S82°41'38"E	270.24'
W7-326	N65°31'37"E	429.61'
W7-327	N29°56'39"E	1133.35'
W7-328	N01°11'20"E	200.81'
W7-329	N35°59'17"W	450.16'
W7-330	N73°31'13"W	251.57'
W7-331	N05°15'10"W	487.19'
W7-332	N42°04'41"W	501.75'
W7-333	N05°32'54"E	62.41'
W7-334	N61°50'22"E	111.08'
W7-335	N39°34'36"E	248.59'
W7-336	N17°18'49"E	292.43'
W7-337	N13°15'30"W	333.74'
W7-338	N45°57'59"W	590.17'
W7-339	N79°45'39"W	520.43'
W7-340	N02°27'29"E	481.66'
W7-341	N10°19'41"W	230.28'
W7-342	N18°16'06"W	59.99'

RECORD OF SURVEY NO. ____

* * *

SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT
ZONE W-7

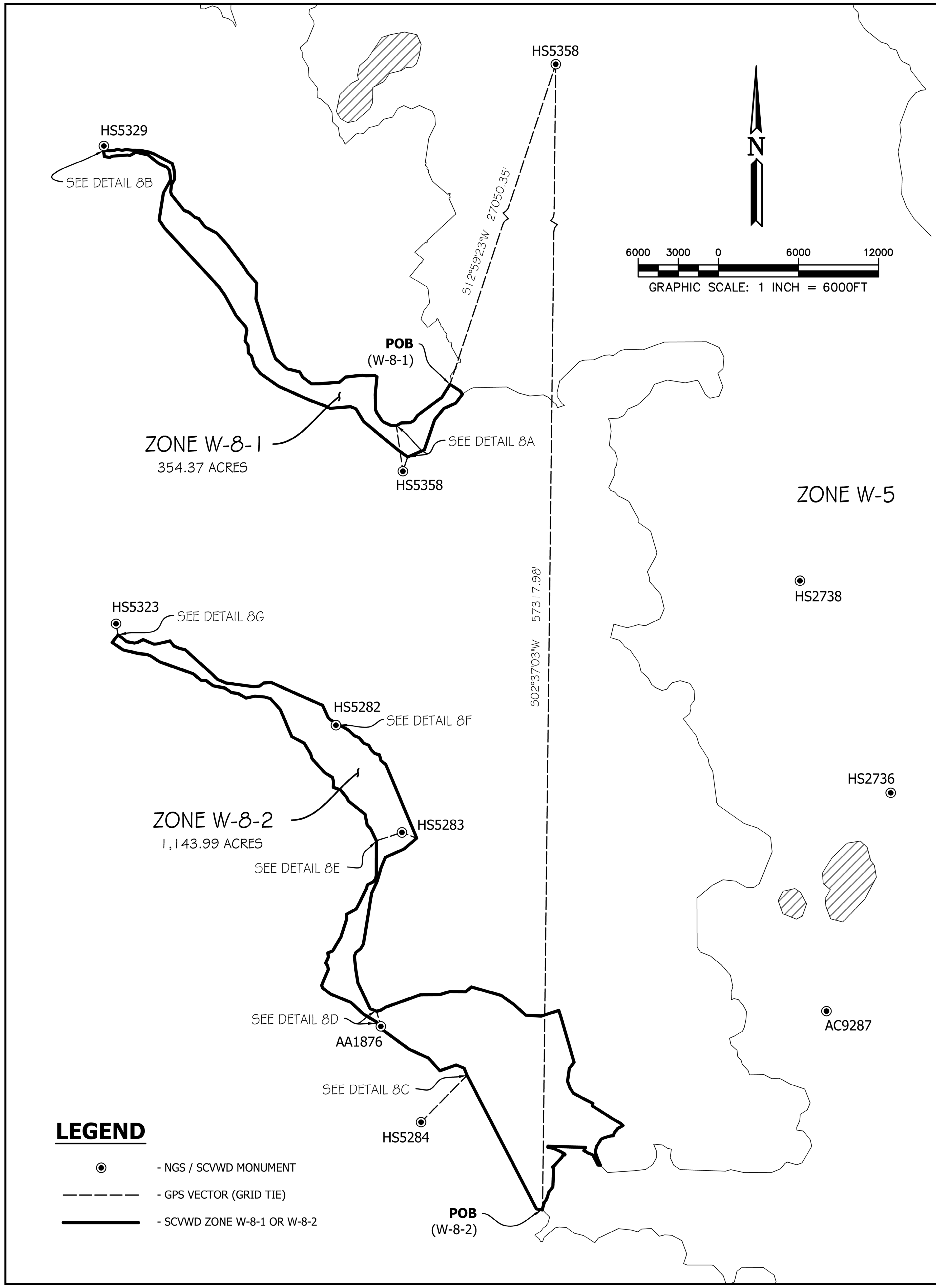
LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

* * *

SCALE: NO SCALE FEBRUARY, 2020

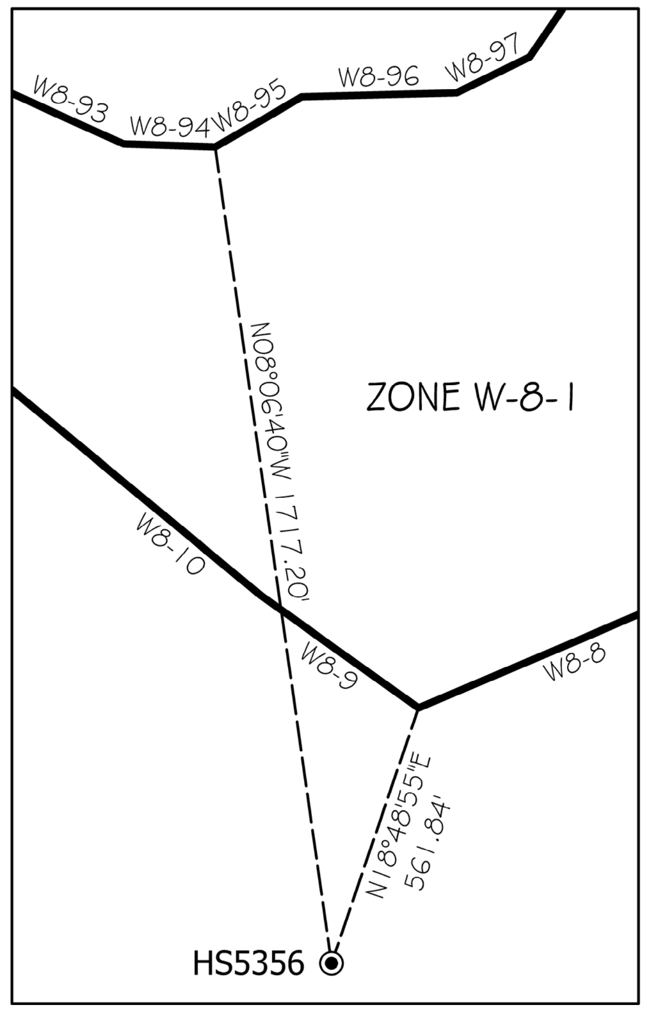
BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

JOB NO. 16310

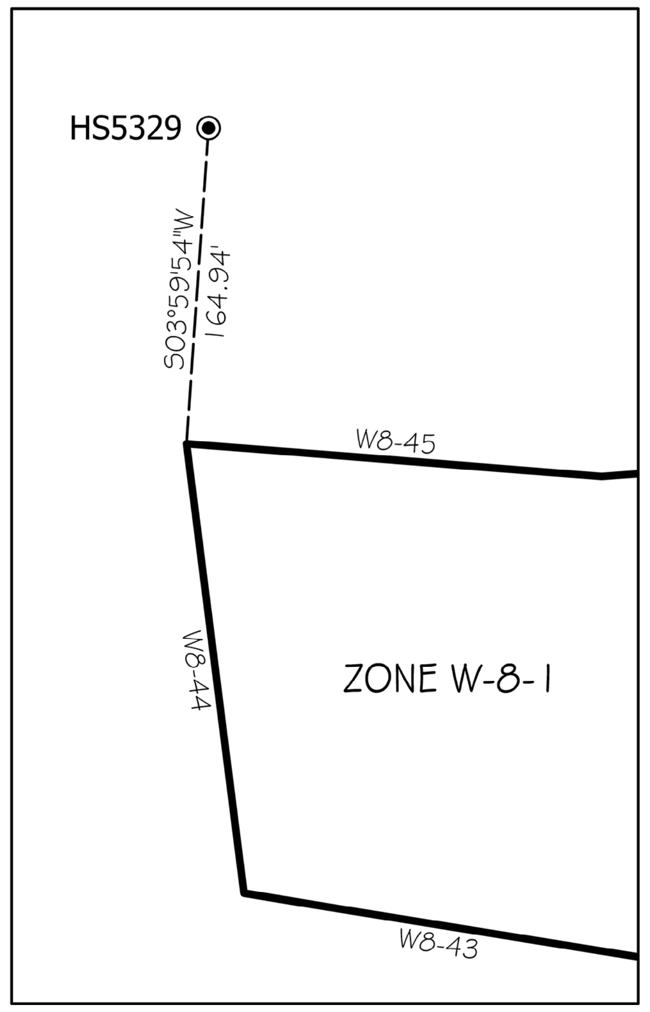


LEGEND

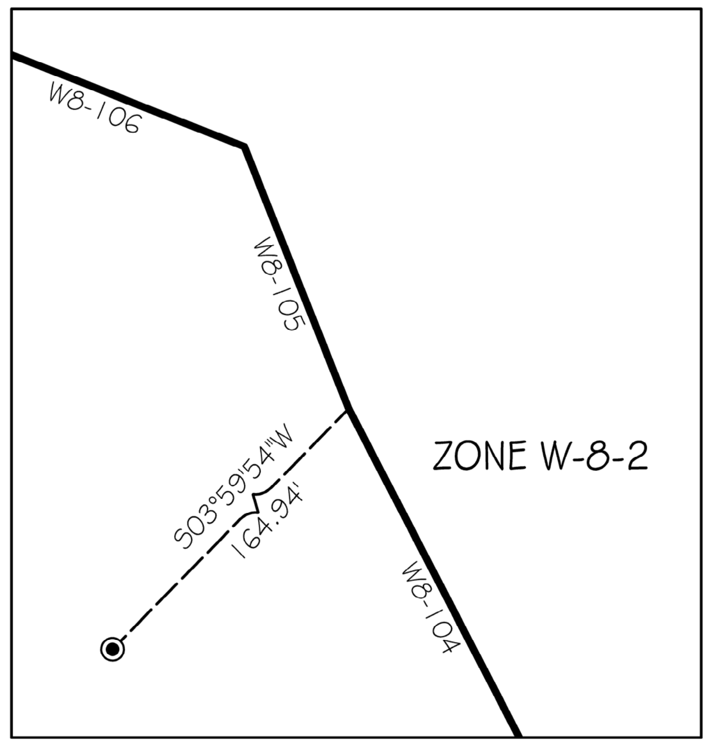
- ● - NGS / SCVWD MONUMENT
- – – – – - GPS VECTOR (GRID TIE)
- ━━━ - SCVWD ZONE W-8-1 OR W-8-2



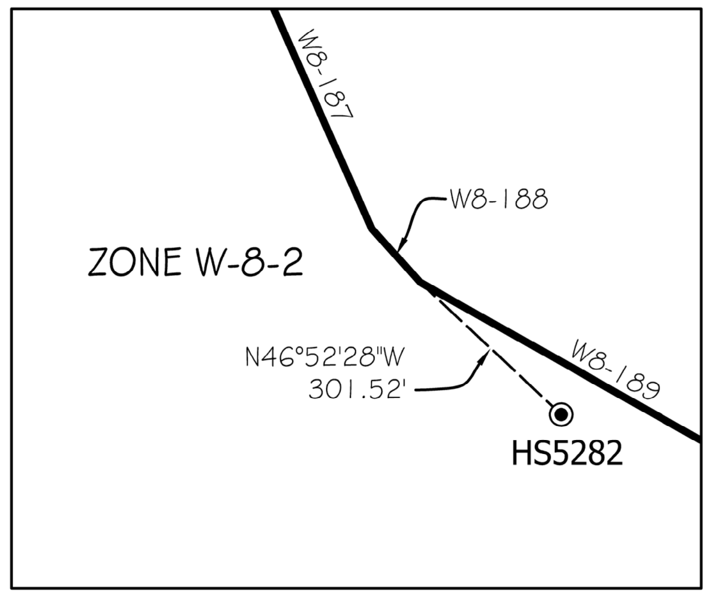
DETAIL 8A
N.T.S.



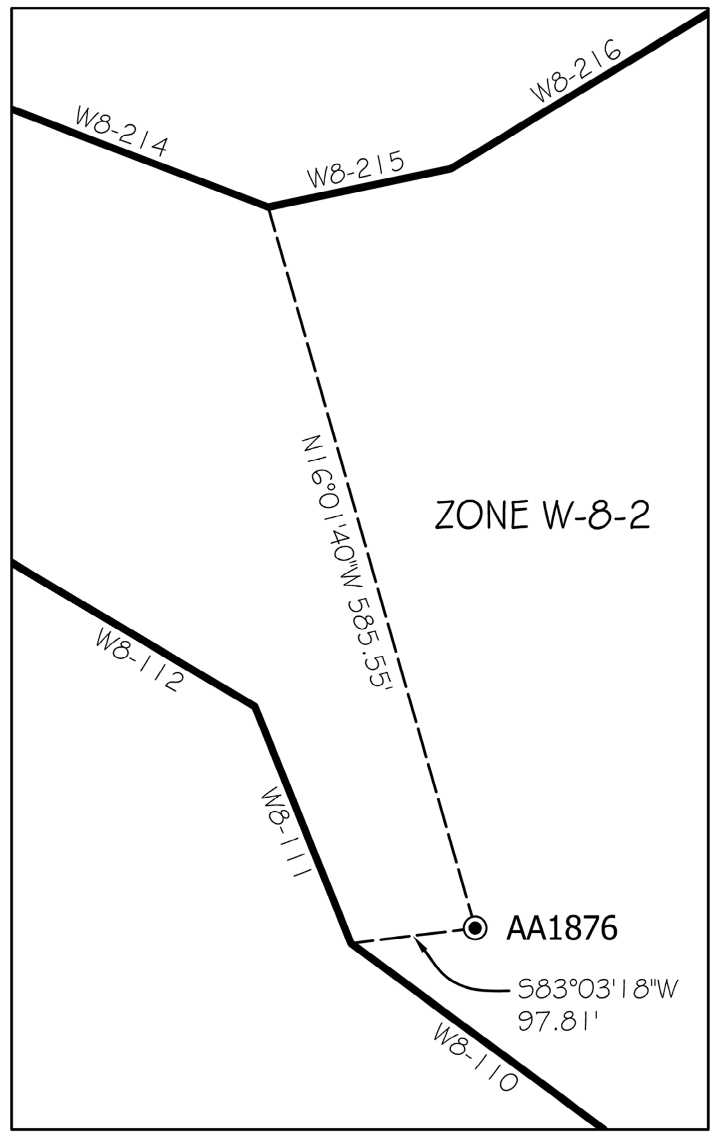
DETAIL 8B
N.T.S.



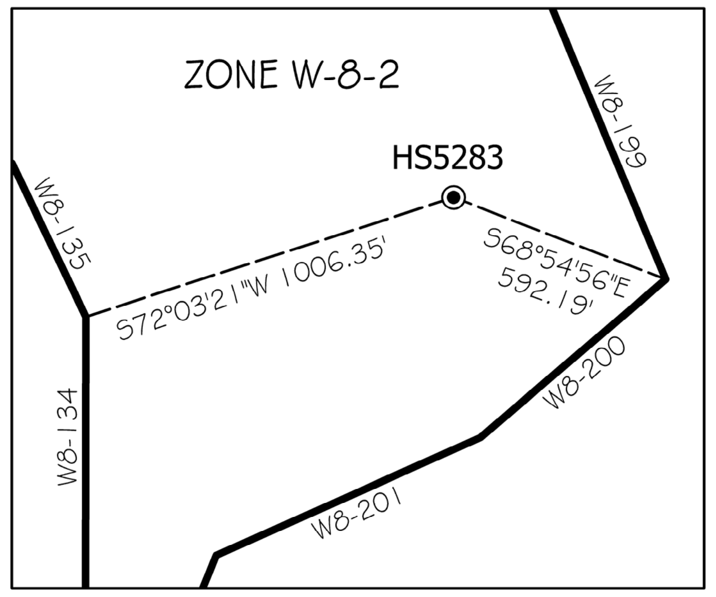
DETAIL 8C
N.T.S.



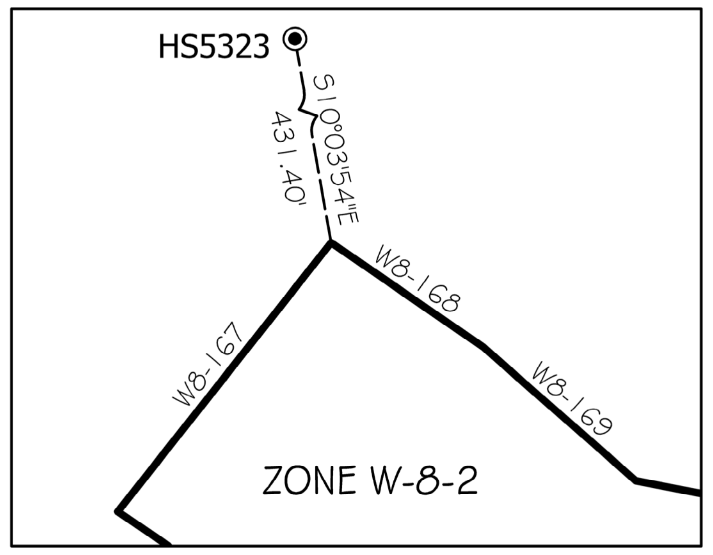
DETAIL 8F
N.T.S.



DETAIL 8D
N.T.S.



DETAIL 8E
N.T.S.



DETAIL 8G
N.T.S.

NOTE

1. LINE TABLE SHOWN ON SHEET 21 REPRESENTS THE COURSES OF ZONE W-8-1 & W-8-2 IN A CLOCKWISE DIRECTION STARTING AT THE POINT OF BEGINNING (POB) AS SHOWN.

RECORD OF SURVEY NO. ____

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

SCALE: AS NOTED FEBRUARY, 2020

BY: TOWILL | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

W-8 LINE TABLE

LINE	BEARING	DISTANCE
W8-1	S56°59'29"E	447.36'
W8-2	S37°08'48"E	150.34'
W8-3	S37°08'48"E	0.60'
W8-4	S37°07'24"W	416.80'
W8-5	S65°29'26"W	487.87'
W8-6	S39°20'59"W	547.21'
W8-7	S18°52'36"W	1193.05'
W8-8	S67°00'08"W	675.91'
W8-9	N54°28'15"W	403.09'
W8-10	N50°28'28"W	1707.98'
W8-11	N31°10'57"W	560.84'
W8-12	N67°28'06"W	221.95'
W8-13	S84°58'13"W	764.50'
W8-14	N63°06'51"W	199.22'
W8-15	N69°25'06"W	655.04'
W8-16	N66°13'15"W	1231.65'
W8-17	N54°51'27"W	832.39'
W8-18	N38°49'38"W	367.92'
W8-19	N16°46'16"W	393.17'
W8-20	N46°32'30"W	162.93'
W8-21	N02°18'49"W	289.52'
W8-22	N34°05'09"W	198.53'
W8-23	N09°11'11"E	407.64'
W8-24	N18°01'16"W	142.54'
W8-25	N41°11'12"W	543.07'
W8-26	N28°42'41"W	876.39'
W8-27	N34°59'55"W	367.96'
W8-28	N42°25'40"W	244.08'
W8-29	N42°49'54"W	2757.97'
W8-30	N33°43'09"W	259.12'
W8-31	N33°45'00"W	113.30'
W8-32	N08°57'34"E	1025.89'
W8-33	N28°56'06"E	562.08'
W8-34	N06°57'51"W	344.58'
W8-35	N37°12'14"W	157.90'
W8-36	N66°24'38"W	328.87'
W8-37	N51°27'42"W	536.58'
W8-38	N77°40'26"W	466.46'
W8-39	S58°20'50"W	250.75'
W8-40	N76°21'37"W	86.05'
W8-41	S86°00'14"W	567.59'
W8-42	S64°44'40"W	109.77'
W8-43	N80°49'20"W	208.15'
W8-44	N07°17'57"W	235.79'
W8-45	S85°33'44"E	216.89'
W8-46	N85°48'20"E	179.51'
W8-47	N71°15'00"E	128.01'
W8-48	S77°06'10"E	178.28'
W8-49	N78°27'00"E	157.58'
W8-50	S83°20'23"E	228.81'
W8-51	S89°35'55"E	290.75'
W8-52	S79°41'43"E	291.15'
W8-53	S70°33'53"E	248.12'
W8-54	S61°59'54"E	781.00'
W8-55	S15°37'39"E	225.77'
W8-56	S07°07'30"E	251.95'
W8-57	S08°35'01"W	139.58'
W8-58	S30°11'06"W	209.05'
W8-59	S05°40'36"W	274.36'
W8-60	S16°52'30"E	106.89'

W-8 LINE TABLE

LINE	BEARING	DISTANCE
W8-61	S38°30'59"E	756.80'
W8-62	S70°04'26"E	205.80'
W8-63	S48°40'39"E	278.20'
W8-64	S73°07'30"E	149.00'
W8-65	S36°23'04"E	217.01'
W8-66	S38°06'52"E	182.37'
W8-67	S61°56'23"E	496.39'
W8-68	S41°55'06"E	601.36'
W8-69	S37°10'53"E	930.36'
W8-70	S33°22'46"E	362.11'
W8-71	S40°57'17"E	508.11'
W8-72	S02°54'42"W	589.73'
W8-73	S17°19'07"E	334.65'
W8-74	S17°42'31"E	1738.13'
W8-75	S21°26'45"E	276.22'
W8-76	S48°37'25"E	575.90'
W8-77	S76°31'30"E	489.03'
W8-78	S28°32'01"E	226.28'
W8-79	S52°41'48"E	414.91'
W8-80	N89°39'37"E	277.50'
W8-81	N85°40'47"E	519.45'
W8-82	N86°15'00"E	251.10'
W8-83	N49°18'39"E	300.55'
W8-84	N83°43'48"E	638.96'
W8-85	S82°11'12"E	137.05'
W8-86	N87°40'34"E	322.05'
W8-87	S56°35'34"E	102.22'
W8-88	S05°40'41"W	655.93'
W8-89	S01°16'53"E	577.41'
W8-90	S20°37'30"E	106.89'
W8-91	S33°21'23"E	379.11'
W8-92	S54°22'30"E	106.89'
W8-93	S65°46'35"E	280.00'
W8-94	S88°07'30"E	190.47'
W8-95	N60°05'30"E	208.00'
W8-96	N88°29'08"E	322.32'
W8-97	N63°45'00"E	169.83'
W8-98	N34°27'31"E	246.97'
W8-99	N53°02'22"E	923.68'
W8-100	N56°23'44"E	199.80'
W8-101	N32°13'50"E	578.91'
W8-102	N87°29'56"W	37.62'
W8-103	N79°23'16"W	199.43'
W8-104	N27°25'29"W	5628.92'
W8-105	N21°42'48"W	293.54'
W8-106	N68°27'48"W	319.53'
W8-107	S70°33'13"W	646.96'
W8-108	N41°59'24"W	645.55'
W8-109	N65°56'44"W	788.90'
W8-110	N53°38'36"W	1433.42'
W8-111	N22°07'32"W	199.42'
W8-112	N59°23'45"W	559.41'
W8-113	N46°53'12"W	642.09'
W8-114	N67°51'48"W	325.77'
W8-115	N67°30'21"W	496.14'
W8-116	N52°50'33"W	372.23'
W8-117	N19°39'38"W	109.04'
W8-118	N23°08'06"E	638.45'
W8-119	N11°40'39"W	145.51'
W8-120	N35°25'52"W	124.48'

W-8 LINE TABLE

LINE	BEARING	DISTANCE
W8-121	N25°02'21"E	249.95'
W8-122	N08°57'11"W	154.60'
W8-123	N67°19'08"E	192.95'
W8-124	N31°24'49"E	593.98'
W8-125	N17°33'41"E	713.50'
W8-126	N00°22'22"W	190.00'
W8-127	N61°21'36"E	410.29'
W8-128	N29°04'46"E	252.69'
W8-129	N25°34'24"E	613.80'
W8-130	N13°58'08"E	131.40'
W8-131	N62°55'26"E	248.22'
W8-132	N35°26'41"E	153.41'
W8-133	N11°14'21"E	121.66'
W8-134	N00°03'15"E	1292.31'
W8-135	N25°44'08"W	488.14'
W8-136	N43°00'09"W	190.63'
W8-137	N11°10'09"W	424.70'
W8-138	N51°33'39"W	795.71'
W8-139	N25°44'40"W	135.81'
W8-140	N39°25'38"W	376.76'
W8-141	N70°42'06"W	283.05'
W8-142	N02°12'31"E	209.26'
W8-143	N12°14'54"W	163.82'
W8-144	N58°10'23"W	342.53'
W8-145	N42°05'27"W	718.68'
W8-146	N14°51'28"W	172.24'
W8-147	N31°06'04"W	477.13'
W8-148	N62°19'50"W	520.07'
W8-149	N23°08'00"W	1109.17'
W8-150	N42°05'50"W	551.56'
W8-151	N75°15'44"W	219.92'
W8-152	N85°16'18"W	362.14'
W8-153	S78°23'32"W	340.00'
W8-154	N60°14'58"W	334.65'
W8-155	N81°38'43"W	252.98'
W8-156	N55°35'59"W	295.94'
W8-157	N79°01'44"W	457.67'
W8-158	N53°45'34"W	312.59'
W8-159	N83°48'24"W	205.66'
W8-160	N49°55'33"W	374.55'
W8-161	N70°20'29"W	1338.19'
W8-162	N56°23'27"W	398.01'
W8-163	N68°59'24"W	143.13'
W8-164	N82°31'53"W	367.47'
W8-165	N77°03'21"W	547.35'
W8-166	N55°59'38"W	497.56'
W8-167	N38°24'24"E	357.53'
W8-168	S55°32'51"E	192.31'
W8-169	S48°45'00"E	210.92'
W8-170	S79°02'43"E	302.06'
W8-171	N76°52'30"E	106.89'
W8-172	N64°25'48"E	246.52'
W8-173	S66°50'40"E	426.94'
W8-174	N87°19'14"E	122.14'
W8-175	N76°35'34"E	500.39'
W8-176	S37°25'07"E	247.68'
W8-177	S68°08'25"E	251.20'
W8-178	S77°33'56"E	193.14'
W8-179	S48°02'59"E	1307.30'
W8-180	S44°46'35"E	328.50'

W-8 LINE TABLE

LINE	BEARING	DISTANCE
W8-181	S66°56'37"E	359.04'
W8-182	S82°38'56"E	1033.58'
W8-183	N84°15'23"E	231.12'
W8-184	N52°20'01"E	183.19'
W8-185	N85°14'06"E	279.12'
W8-186	S66°02'11"E	2114.68'
W8-187	S24°00'10"E	493.72'
W8-188	S42°05'27"E	113.00'
W8-189	S60°40'28"E	783.43'
W8-190	S45°41'59"E	302.49'
W8-191	S66°51'29"E	205.89'
W8-192	S39°49'00"E	271.46'
W8-193	S69°00'27"E	189.91'
W8-194	S30°18'09"E	229.02'
W8-195	S44°53'37"E	165.30'
W8-196	S75°17'13"E	178.68'
W8-197	S16°17'14"E	225.19'
W8-198	S50°18'00"E	229.26'
W8-199	S22°45'06"E	2992.05'
W8-200	S49°33'55"W	634.67'
W8-201	S65°58'57"W	752.51'
W8-202	S22°33'26"W	407.27'
W8-203	S16°26'35"W	539.17'
W8-204	S24°36'45"W	496.23'
W8-205	S09°42'38"W	396.88'
W8-206	S08°59'21"W	1215.95'
W8-207	S09°39'34"W	327.16'
W8-208	S32°13'55"W	192.41'
W8-209	S51°54'31"W	222.81'
W8-210	S22°17'29"W	152.97'
W8-211	S06°15'57"E	527.46'
W8-212	S09°16'34"E	482.02'
W8-213	S25°10'02"E	1072.51'
W8-214	S69°07'12"E	256.43'
W8-215	N78°07'19"E	145.82'
W8-216	N58°51'59"E	245.59'
W8-217	N70°19'08"E	1369.31'
W8-218	N89°13'06"E	734.89'
W8-219	N73°18'17"E	384.48'
W8-220	S89°24'46"E	592.83'
W8-221	N50°10'44"E	276.68'
W8-222	S74°13'33"E	1156.06'
W8-223	S54°28'09"E	567.34'
W8-224	S47°52'49"E	614.27'
W8-225	S86°30'53"E	581.12'
W8-226	N72°35'45"E	692.34'
W8-227	S18°05'43"E	321.68'
W8-228	S16°07'20"E	1698.42'
W8-229	S38°00'40"W	287.68'
W8-230	S08°02'38"W	489.59'
W8-231	S20°45'46"E	271.44'
W8-232	S32°23'44"E	227.04'
W8-233	S62°14'09"E	450.38'
W8-234	S63°11'19"E	353.56'
W8-235	S66°14'00"E	17.67'
W8-236	S22°43'20"W	27.32'
W8-237	S17°46'37"W	24.20'
W8-238	S01°52'27"W	49.27'
W8-239	S57°29'35"E	907.02'
W8-240	S59°45'27"E	340.93'

W-8 LINE TABLE

LINE	BEARING	DISTANCE
W8-241	S49°04'58"E	120.10'
W8-242	S61°14'53"W	229.47'
W8-243	S39°44'23"W	184.56'
W8-244	S20°54'31"W	132.34'
W8-245	S87°22'39"W	76.54'
W8-246	S76°50'28"W	59.31'
W8-247	S72°56'15"W	222.68'
W8-248	S66°49'01"W	109.94'
W8-249	S32°34'13"W	330.48'
W8-250	S12°59'41"W	208.46'
W8-251	S17°44'41"E	273.43'
W8-252	S24°14'59"E	254.15'
W8-253	N88°26'09"W	68.20'
W8-254	N81°02'09"W	18.46'
W8-255	N40°11'12"W	31.43'
W8-256	N26°49'42"W	363.82'
W8-257	N11°16'20"E	16.11'
W8-258	N67°18'52"W	237.75'
W8-259	N53°15'52"W	42.87'
W8-260	N63°00'35"W	106.43'
W8-261	N26°59'25"E	140.05'
W8-262	N88°16'12"W	1407.24'
W8-263	S08°11'13"W	37.23'
W8-264	S76°43'08"E	241.04'
W8-265	S66°12'49"E	241.99'
W8-266	S61°06'07"E	205.19'
W8-267	S16°03'28"E	29.42'
W8-268	S30°22'45"W	18.58'
W8-269	N59°37'17"W	63.56'
W8-270	S24°31'09"W	126.00'
W8-271	S42°42'58"W	435.59'
W8-272	S57°12'08"W	74.35'
W8-273	S46°08'11"E	67.13'
W8-274	S02°21'57"W	699.86'
W8-275	S37°25'13"W	257.53'
W8-276	S15°18'44"W	196.06'
W8-277	S24°46'38"W	113.24'
W8-278	S42°30'49"W	85.84'
W8-279	S16°38'13"W	213.43'
W8-280	S06°06'27"W	95.79'

RECORD OF SURVEY NO. ____

* * *

SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT
ZONE W-8

LYING WITHIN THE COUNTY OF SANTA CLARA, CALIFORNIA

* * *

SCALE: NO SCALE   FEBRUARY, 2020

BY: **TOWILL** | Surveying, Mapping and GIS Services
2300 Clayton Road, Suite 1200
Concord, CA 94520-2176

SHEET 21 OF 21

Appendix L-4

Adopted Metes and Bounds for Amended Zone W-2

BOARD OF DIRECTORS
SANTA CLARA VALLEY WATER DISTRICT

RESOLUTION NO. 20-12

RESOLUTION AMENDING THE BOUNDARIES OF GROUNDWATER BENEFIT ZONE W-2

WHEREAS, the Santa Clara Valley Water District (Valley Water) is charged with managing the groundwater subbasins in Santa Clara County per the Santa Clara Valley Water District Act and the Sustainable Groundwater Management Act; and

WHEREAS, the Santa Clara Valley Water District Act authorizes the Valley Water Board of Directors to establish zones encompassing areas where groundwater pumpers benefit directly and indirectly from Valley Water activities to protect and augment water supplies; and

WHEREAS, by assessing a groundwater production charge on water producing facilities within the groundwater benefit zones, Valley Water funds and implements projects and activities for the benefit of groundwater pumpers in the zone, ensuring continued groundwater supply and sustainability, consistent with the purposes set forth in the District Act and requirements of the Sustainable Groundwater Management Act; and

WHEREAS, the Valley Water groundwater benefit zone W-2 was established in 1963 and last modified in 1971; and

WHEREAS, Valley Water's activities benefitting groundwater pumpers have changed, and new and more detailed information has become available regarding the groundwater subbasins Valley Water manages since the existing groundwater benefit zones were first established; and

WHEREAS, Valley Water undertook an independent, science-based study beginning in 2014 to ensure the zones reflect the most recent and relevant data regarding the services and benefits received by well owners and operators (well users); and

WHEREAS, Valley Water conducted the study with extensive public outreach including notices to potentially affected well users and interested parties, presentations to Valley Water Board of Directors committees and public agencies, meetings and communication with individual well users and water retailers, and open houses; and

WHEREAS, after completing the study using the best available science and considering information provided by well users, it was determined that all well users in proposed modified Zone W-2 are benefiting in a reasonably similar way from Valley Water activities to protect and augment groundwater supplies; and

WHEREAS, the results of the study and the proposed modification of Zone W-2 were presented to the Board of Directors on August 27, 2019, and October 8, 2019; and

WHEREAS, on October 8, 2019, the Board of Directors directed staff to prepare metes and bounds for modified groundwater benefit zone W-2 for consideration at a public hearing.

NOW, THEREFORE BE IT RESOLVED that the Board of Directors of the Santa Clara Valley Water District declares as follows:

1. The boundaries of groundwater benefit zone W-2 are amended as described in Exhibit A.
2. The amended groundwater benefit zone W-2 shall become effective on July 1, 2020.

PASSED AND ADOPTED by the Board of Directors of the Santa Clara Valley Water District by the following vote on April 28, 2020:

AYES: Directors R. Santos, G. Kremen, T. Estremera, N. Hsueh, B. Keegan, L. LeZotte, J. Varela

NOES: Directors None

ABSENT: Directors None

ABSTAIN: Directors None

SANTA CLARA VALLEY WATER DISTRICT

NAI HSUEH
Chair, Board of Directors

ATTEST: MICHELE L. KING, CMC

Michele L. King
Clerk, Board of Directors

EXHIBIT A
COVERSHEET

METES AND BOUNDS DESCRIPTION FOR SANTA CLARA VALLEY WATER DISTRICT GROUNDWATER BENEFIT ZONE W-2 AT SANTA CLARA COUNTY, CALIFORNIA

No. of Pages:	56
Exhibit Attachments:	Attachment 1: Metes and Bounds Description for Santa Clara Valley Water District Groundwater Benefit Zone W-2 at Santa Clara County, California

METES AND BOUNDS DESCRIPTION
FOR
SANTA CLARA VALLEY WATER DISTRICT
GROUND WATER BENEFIT ZONE W-2
AT
SANTA CLARA COUNTY, CALIFORNIA

ALL THAT CERTAIN AREA situate in the County of Santa Clara, State of California, being more particularly described as follows:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of N **1,918,486.92**, E **6,182,012.53**, said brass disc being **SOUTH 50°56'16" EAST 85,739.16** feet from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of N **1,972,516.68**, E **6,115,439.35**;

Thence from said **POINT OF COMMENCEMENT, SOUTH 54°56'55" EAST 19,076.99** feet to a point with grid coordinates of N **1,907,530.83**, E **6,197,629.69**, said point being the **TRUE POINT OF BEGINNING**;

Thence in a clockwise direction, the following two thousand two hundred fifty-one (2,251) courses:

1) **NORTH 18°16'06" WEST 207.72 feet;**
2) **NORTH 38°34'15" WEST 230.57 feet;**
3) **NORTH 55°49'22" WEST 194.60 feet;**
4) **NORTH 73°58'22" WEST 1248.42 feet;**
5) **SOUTH 85°40'12" WEST 531.45 feet;**
6) **SOUTH 71°02'34" WEST 595.55 feet;**
7) **NORTH 79°33'50" WEST 601.94 feet;**
8) **SOUTH 64°34'19" WEST 431.47 feet;**
9) **SOUTH 18°43'39" WEST 520.35 feet;**
10) **SOUTH 10°51'49" EAST 246.26 feet;**
11) **SOUTH 54°59'13" EAST 363.47 feet;**
12) **SOUTH 36°04'25" WEST 481.71 feet;**
13) **SOUTH 21°11'51" WEST 168.46 feet;**
14) **SOUTH 00°16'06" WEST 382.68 feet;**
15) **SOUTH 42°35'17" WEST 167.93 feet;**
16) **SOUTH 10°21'35" WEST 372.87 feet;**
17) **SOUTH 18°17'07" EAST 463.19 feet;**
18) **SOUTH 43°01'20" EAST 328.06 feet;**
19) **SOUTH 59°22'36" EAST 309.07 feet;**
20) **SOUTH 20°08'58" EAST 142.25 feet;**
21) **NORTH 80°34'49" WEST 429.10 feet;**
22) **SOUTH 65°01'29" WEST 413.26 feet;**
23) **SOUTH 21°40'50" WEST 435.09 feet;**
24) **SOUTH 46°01'08" WEST 211.91 feet;**
25) **NORTH 10°33'03" EAST 335.74 feet;**

26) NORTH 14°56'22” WEST 410.61 feet;
27) NORTH 61°06'21” WEST 288.18 feet;
28) SOUTH 75°09'48” WEST 390.79 feet;
29) NORTH 81°20'03” WEST 126.87 feet;
30) NORTH 28°43'41” WEST 375.79 feet;
31) NORTH 62°56'45” WEST 484.09 feet;
32) NORTH 29°03'59” WEST 574.63 feet to a point, having grid coordinates of N 1,905,900.54, E 6,191,517.29 said point being SOUTH 09°18'00" WEST 4946.51 feet from SCVWD Benchmark "BM561", being a 2-inch brass disc, punched and stamped "BM 561 RESET 2001", having grid coordinates of N 1,910,782.03, E 6,192,316.66;

33) NORTH 65°25'27” WEST 347.91 feet;
34) NORTH 83°53'51” WEST 782.98 feet;
35) SOUTH 76°08'07” WEST 704.68 feet;
36) SOUTH 54°39'04” WEST 333.57 feet;
37) SOUTH 20°15'50” WEST 376.00 feet;
38) SOUTH 21°01'42” EAST 473.01 feet;
39) SOUTH 61°17'20” EAST 278.15 feet;
40) SOUTH 83°49'32” EAST 526.30 feet;
41) SOUTH 05°00'54” WEST 318.47 feet;
42) SOUTH 86°51'40” WEST 154.23 feet;
43) NORTH 68°54'01” WEST 662.68 feet;
44) SOUTH 77°46'16” WEST 176.06 feet;
45) SOUTH 62°12'24” WEST 470.24 feet;
46) NORTH 28°26'17” WEST 1098.12 feet;
47) NORTH 54°18'30” WEST 607.05 feet;
48) NORTH 74°26'02” WEST 392.17 feet;
49) NORTH 33°30'56” WEST 282.50 feet;
50) NORTH 56°22'35” WEST 425.67 feet;
51) SOUTH 85°30'35” WEST 239.09 feet;
52) NORTH 29°45'34” WEST 268.03 feet;
53) NORTH 50°08'14” WEST 738.29 feet;
54) NORTH 05°08'21” WEST 392.73 feet;
55) NORTH 27°46'35” WEST 352.96 feet;
56) NORTH 59°51'03” WEST 278.37 feet;
57) SOUTH 69°28'13” WEST 336.32 feet;
58) NORTH 74°57'43” WEST 542.69 feet;
59) SOUTH 88°26'40” WEST 1909.71 feet;
60) SOUTH 79°59'33” WEST 439.17 feet;
61) SOUTH 63°50'20” WEST 732.60 feet;
62) NORTH 56°04'00” WEST 227.34 feet;
63) NORTH 25°24'30” EAST 464.58 feet;
64) NORTH 18°04'03” WEST 296.63 feet;
65) NORTH 63°43'30” WEST 433.27 feet;
66) SOUTH 80°08'34” WEST 915.09 feet;
67) NORTH 28°27'50” WEST 252.88 feet;
68) NORTH 64°24'52” WEST 305.68 feet;
69) SOUTH 72°45'29” WEST 398.16 feet;
70) NORTH 74°55'52” WEST 173.86 feet;
71) NORTH 52°42'00” WEST 226.02 feet;

72) NORTH 79°47'58" WEST 299.39 feet;
73) NORTH 46°43'11" EAST 284.11 feet;
74) NORTH 76°34'43" EAST 426.58 feet;
75) NORTH 42°35'47" EAST 325.12 feet;
76) NORTH 60°36'04" EAST 503.70 feet;
77) NORTH 13°01'41" EAST 561.69 feet;
78) NORTH 17°17'21" WEST 501.20 feet;
79) NORTH 44°04'50" WEST 291.08 feet;
80) NORTH 80°00'03" WEST 240.83 feet;
81) SOUTH 61°17'12" WEST 1085.75 feet;
82) NORTH 53°19'49" WEST 467.60 feet;
83) SOUTH 73°57'53" WEST 537.74 feet;
84) SOUTH 31°58'13" WEST 349.22 feet;
85) SOUTH 01°01'06" WEST 562.53 feet;
86) SOUTH 25°38'22" WEST 314.06 feet;
87) NORTH 44°13'22" WEST 427.39 feet;
88) NORTH 81°45'37" WEST 468.46 feet;
89) SOUTH 55°14'55" WEST 235.37 feet;
90) SOUTH 34°13'40" WEST 324.38 feet;
91) SOUTH 78°01'52" WEST 295.78 feet;
92) NORTH 82°13'23" WEST 548.14 feet;
93) SOUTH 78°07'56" WEST 340.08 feet;
94) SOUTH 57°06'10" WEST 574.08 feet;
95) SOUTH 32°35'34" WEST 413.83 feet;
96) NORTH 74°50'54" WEST 346.13 feet;
97) SOUTH 75°34'33" WEST 314.25 feet;
98) SOUTH 75°34'33" WEST 272.10 feet;
99) NORTH 32°20'45" WEST 411.02 feet;
100) NORTH 54°26'29" WEST 301.96 feet;
101) NORTH 70°10'38" WEST 2161.42 feet to a point, having grid coordinates of N 1,909,750.08, E 6,171,208.84, said point being SOUTH 51°02'16" WEST 13894.32 feet from said NGS Monument "QQ 453" (PID HS2787), having grid coordinates of N 1,918,486.92, E 6,182,012.53;

102) NORTH 78°22'53" WEST 820.47 feet;
103) NORTH 56°16'17" WEST 426.95 feet;
104) NORTH 41°39'54" WEST 501.29 feet;
105) NORTH 85°09'21" WEST 533.37 feet;
106) NORTH 48°53'16" WEST 299.71 feet;
107) NORTH 81°29'51" WEST 264.28 feet;
108) NORTH 37°19'26" EAST 307.01 feet;
109) NORTH 04°47'49" EAST 433.81 feet;
110) NORTH 41°21'23" WEST 544.14 feet;
111) NORTH 81°28'05" WEST 538.04 feet;
112) SOUTH 54°17'57" WEST 340.17 feet;
113) NORTH 38°00'38" WEST 353.64 feet;
114) NORTH 81°29'21" WEST 969.62 feet;
115) NORTH 61°05'49" WEST 1243.40 feet;
116) NORTH 39°06'21" WEST 574.15 feet;
117) NORTH 49°34'06" EAST 530.63 feet;
118) NORTH 07°31'51" EAST 549.32 feet;

119) NORTH 35°01'37" WEST 358.28 feet;
120) NORTH 62°43'36" WEST 338.63 feet;
121) NORTH 38°09'26" WEST 487.76 feet;
122) NORTH 89°09'10" WEST 592.07 feet;
123) NORTH 72°52'25" WEST 678.71 feet;
124) SOUTH 84°31'45" WEST 150.51 feet;
125) SOUTH 58°46'36" WEST 1091.22 feet;
126) SOUTH 42°17'29" WEST 181.40 feet;
127) SOUTH 00°24'31" WEST 285.93 feet;
128) SOUTH 30°40'47" EAST 689.74 feet;
129) SOUTH 80°47'00" EAST 581.68 feet;
130) SOUTH 55°43'41" EAST 329.81 feet;
131) SOUTH 13°23'14" WEST 299.93 feet;
132) SOUTH 09°00'35" EAST 249.76 feet;
133) SOUTH 73°15'50" WEST 256.93 feet;
134) SOUTH 51°21'00" WEST 502.07 feet;
135) SOUTH 35°41'07" WEST 367.39 feet;
136) NORTH 26°15'00" WEST 328.08 feet;
137) NORTH 80°37'30" WEST 270.80 feet;
138) SOUTH 64°11'54" WEST 657.35 feet;
139) SOUTH 19°49'29" WEST 384.49 feet;
140) SOUTH 19°05'27" EAST 354.45 feet;
141) SOUTH 62°00'51" EAST 345.15 feet;
142) NORTH 66°14'32" EAST 495.11 feet;
143) NORTH 37°07'31" EAST 214.98 feet;
144) SOUTH 08°23'33" EAST 466.58 feet;
145) SOUTH 41°05'26" EAST 645.01 feet;
146) SOUTH 65°53'55" EAST 393.17 feet;
147) SOUTH 84°14'11" EAST 624.55 feet;
148) SOUTH 71°42'56" WEST 742.17 feet;
149) SOUTH 07°48'20" WEST 469.44 feet;
150) SOUTH 37°22'35" EAST 747.32 feet;
151) SOUTH 52°47'04" EAST 836.67 feet;
152) SOUTH 71°25'55" EAST 960.11 feet;
153) SOUTH 61°52'09" EAST 446.50 feet;
154) NORTH 85°14'42" EAST 564.78 feet;
155) SOUTH 55°41'37" EAST 751.77 feet;
156) NORTH 78°27'09" EAST 330.22 feet;
157) SOUTH 22°44'17" WEST 278.19 feet;
158) SOUTH 08°08'02" EAST 328.04 feet;
159) SOUTH 48°21'55" EAST 464.61 feet;
160) SOUTH 71°33'28" EAST 224.57 feet;
161) SOUTH 23°10'21" EAST 300.84 feet;
162) SOUTH 53°19'47" EAST 1191.41 feet to a point, having grid coordinates of N 1,905,895.18, E 6,168,738.82, said point being SOUTH 37°19'30" EAST 618.77 feet from SCVWD Benchmark "BM395", being a 2-inch brass disc, punched with no stamping, having grid coordinates of 1,906,387.23, E 6,168,363.64;

163) SOUTH 73°00'50" EAST 341.56 feet;
164) NORTH 87°29'49" EAST 968.11 feet;

165) NORTH 60°45'32" EAST 666.48 feet;
166) SOUTH 34°14'40" EAST 712.16 feet;
167) SOUTH 77°51'03" EAST 211.17 feet;
168) SOUTH 20°47'45" WEST 310.40 feet;
169) SOUTH 00°57'08" EAST 243.13 feet;
170) SOUTH 29°03'16" EAST 695.85 feet;
171) SOUTH 62°46'07" EAST 724.34 feet;
172) SOUTH 77°45'33" EAST 383.61 feet;
173) SOUTH 28°12'18" WEST 395.61 feet;
174) SOUTH 24°30'19" EAST 445.74 feet;
175) SOUTH 69°14'05" EAST 1718.40 feet;
176) SOUTH 60°37'22" EAST 1422.09 feet;
177) SOUTH 85°16'57" EAST 281.02 feet;
178) SOUTH 61°24'42" EAST 315.10 feet;
179) SOUTH 20°53'44" EAST 433.49 feet;
180) SOUTH 40°16'24" EAST 196.73 feet;
181) SOUTH 57°43'12" EAST 685.00 feet;
182) SOUTH 88°07'11" EAST 483.31 feet;
183) SOUTH 22°08'16" EAST 187.34 feet;
184) SOUTH 49°45'03" EAST 616.16 feet;
185) SOUTH 38°04'22" EAST 533.04 feet;
186) SOUTH 38°04'22" EAST 361.86 feet;
187) SOUTH 62°25'02" EAST 527.05 feet;
188) NORTH 87°04'43" EAST 426.73 feet;
189) SOUTH 26°35'34" EAST 128.49 feet;
190) SOUTH 44°00'30" EAST 524.85 feet;
191) SOUTH 86°39'20" EAST 484.45 feet;
192) NORTH 78°38'23" EAST 648.34 feet;
193) SOUTH 78°48'35" EAST 317.54 feet;
194) NORTH 80°45'03" EAST 334.59 feet;
195) SOUTH 73°53'44" EAST 526.97 feet;
196) NORTH 82°25'10" EAST 655.80 feet;
197) NORTH 56°18'50" EAST 468.74 feet;
198) NORTH 76°45'35" EAST 230.12 feet;
199) SOUTH 14°33'21" EAST 242.41 feet;
200) SOUTH 32°31'01" EAST 789.53 feet;
201) SOUTH 26°15'46" EAST 559.32 feet;
202) SOUTH 47°08'15" EAST 233.81 feet;
203) SOUTH 71°27'20" EAST 590.56 feet;
204) SOUTH 03°29'07" EAST 209.33 feet;
205) SOUTH 60°02'26" WEST 370.31 feet;
206) SOUTH 18°10'25" WEST 466.87 feet;
207) SOUTH 02°50'15" EAST 693.97 feet;
208) SOUTH 15°12'07" EAST 225.65 feet;
209) SOUTH 66°25'54" EAST 657.11 feet;
210) SOUTH 83°54'00" WEST 259.57 feet;
211) NORTH 67°48'23" WEST 316.06 feet;
212) SOUTH 72°55'03" WEST 356.26 feet;
213) SOUTH 33°42'29" WEST 411.88 feet;
214) SOUTH 15°05'19" EAST 678.76 feet to a point, having grid coordinates of N 1,894,387.09, E 6,183,919.39, said point being NORTH 58°26'36" WEST

12789.41 feet from NGS Monument "HJH 51" (PID HS5239), being a 3-inch brass disc, punched and stamped "HFH 51 513 1948", having grid coordinates of N 1,887,693.87, E 6,194,817.56;

215) NORTH 41°43'43" WEST 882.25 feet;
216) NORTH 63°45'16" WEST 485.99 feet;
217) NORTH 83°25'51" WEST 178.47 feet;
218) NORTH 43°08'48" WEST 267.27 feet;
219) NORTH 76°21'13" WEST 328.95 feet;
220) SOUTH 78°53'37" WEST 307.55 feet;
221) SOUTH 69°10'09" WEST 360.20 feet;
222) NORTH 24°03'36" WEST 504.67 feet;
223) NORTH 85°07'38" WEST 420.32 feet;
224) SOUTH 57°56'28" WEST 404.70 feet;
225) NORTH 47°47'54" WEST 144.06 feet;
226) NORTH 70°24'06" WEST 252.03 feet;
227) NORTH 45°34'48" WEST 364.22 feet;
228) NORTH 73°22'22" WEST 265.77 feet;
229) SOUTH 82°44'03" WEST 632.80 feet;
230) NORTH 65°53'29" WEST 377.87 feet;
231) NORTH 35°47'13" WEST 144.85 feet;
232) NORTH 65°22'48" WEST 311.31 feet;
233) NORTH 27°27'29" WEST 402.21 feet;
234) NORTH 86°22'08" WEST 275.76 feet;
235) SOUTH 51°49'39" WEST 503.79 feet;
236) SOUTH 84°01'34" WEST 164.82 feet;
237) SOUTH 44°11'44" WEST 308.18 feet;
238) SOUTH 14°07'32" EAST 489.48 feet;
239) SOUTH 03°24'30" EAST 488.23 feet;
240) SOUTH 32°06'00" WEST 319.51 feet;
241) SOUTH 14°55'31" EAST 483.23 feet;
242) SOUTH 21°03'26" WEST 116.31 feet;
243) NORTH 60°24'43" WEST 311.35 feet;
244) NORTH 36°59'32" WEST 231.78 feet;
245) NORTH 57°41'48" WEST 298.25 feet;
246) NORTH 42°08'24" WEST 725.21 feet;
247) NORTH 59°41'50" WEST 333.14 feet;
248) NORTH 36°02'48" WEST 161.70 feet;
249) NORTH 59°51'38" WEST 302.09 feet;
250) NORTH 45°45'01" WEST 253.40 feet;
251) NORTH 68°28'03" WEST 333.71 feet;
252) NORTH 32°57'43" WEST 190.56 feet;
253) NORTH 52°45'05" WEST 655.32 feet;
254) NORTH 81°32'10" WEST 427.85 feet;
255) SOUTH 65°29'51" WEST 283.26 feet;
256) NORTH 66°46'45" WEST 438.23 feet;
257) NORTH 87°41'59" WEST 148.85 feet;
258) NORTH 64°13'05" WEST 386.20 feet;
259) NORTH 23°19'30" WEST 238.43 feet;
260) NORTH 40°50'29" WEST 555.89 feet;
261) NORTH 30°03'16" WEST 1002.64 feet;

262) NORTH 51°38'54" WEST 594.43 feet;
263) SOUTH 82°14'21" WEST 465.11 feet;
264) SOUTH 52°28'27" WEST 291.31 feet;
265) NORTH 04°56'01" WEST 226.71 feet;
266) NORTH 22°24'06" WEST 463.73 feet;
267) NORTH 43°06'03" WEST 1242.29 feet;
268) NORTH 53°02'19" WEST 1419.74 feet;
269) SOUTH 82°45'40" WEST 309.43 feet;
270) SOUTH 32°44'49" WEST 307.65 feet;
271) NORTH 23°19'41" WEST 630.57 feet;
272) NORTH 47°46'58" WEST 981.43 feet;
273) NORTH 70°30'32" WEST 489.66 feet;
274) SOUTH 77°03'52" WEST 403.30 feet;
275) SOUTH 41°42'48" WEST 494.61 feet;
276) NORTH 35°31'47" WEST 228.91 feet;
277) NORTH 84°37'06" WEST 508.54 feet;
278) SOUTH 48°50'26" WEST 316.07 feet;
279) NORTH 53°38'30" WEST 528.50 feet;
280) NORTH 76°50'59" WEST 585.90 feet;
281) SOUTH 67°45'41" WEST 374.92 feet;
282) NORTH 33°49'33" WEST 267.09 feet;
283) NORTH 70°40'48" WEST 661.47 feet;
284) SOUTH 63°39'31" WEST 248.90 feet;
285) SOUTH 33°24'23" WEST 433.65 feet;
286) SOUTH 76°33'07" WEST 242.30 feet;
287) SOUTH 36°13'41" WEST 245.33 feet;
288) SOUTH 14°16'21" WEST 156.67 feet;
289) NORTH 17°41'18" WEST 588.34 feet;
290) NORTH 69°41'40" WEST 296.03 feet;
291) NORTH 31°14'31" WEST 210.29 feet;
292) NORTH 55°43'01" WEST 221.13 feet;
293) NORTH 50°46'13" EAST 685.69 feet;
294) NORTH 06°14'23" EAST 235.36 feet;
295) NORTH 36°31'11" WEST 787.03 feet;
296) NORTH 56°38'54" WEST 417.04 feet;
297) NORTH 83°46'40" WEST 435.31 feet;
298) SOUTH 69°44'58" WEST 210.21 feet;
299) SOUTH 49°14'57" WEST 654.79 feet;
300) NORTH 65°22'50" WEST 379.83 feet;
301) NORTH 89°49'03" WEST 339.59 feet;
302) NORTH 03°47'00" WEST 307.04 feet;
303) NORTH 27°16'02" WEST 293.72 feet;
304) NORTH 04°30'11" EAST 161.19 feet;
305) NORTH 24°34'00" WEST 291.55 feet;
306) NORTH 50°23'09" WEST 367.04 feet;
307) NORTH 25°26'47" WEST 212.76 feet;
308) NORTH 44°23'26" WEST 168.57 feet;
309) NORTH 00°53'39" WEST 110.80 feet;
310) NORTH 79°12'22" EAST 395.85 feet;
311) NORTH 52°31'35" EAST 441.54 feet;
312) NORTH 19°13'34" EAST 365.72 feet;

313) NORTH 32°28'16" WEST 796.86 feet;
314) NORTH 07°13'24" WEST 565.19 feet;
315) NORTH 65°29'22" WEST 430.26 feet;
316) SOUTH 63°27'22" WEST 288.36 feet;
317) SOUTH 80°16'23" WEST 391.65 feet;
318) NORTH 61°56'53" WEST 470.01 feet;
319) NORTH 88°21'58" WEST 652.41 feet;
320) NORTH 05°19'40" WEST 333.49 feet;
321) NORTH 56°38'33" WEST 355.45 feet;
322) SOUTH 73°35'33" WEST 519.79 feet;
323) SOUTH 33°52'18" WEST 597.52 feet;
324) SOUTH 10°16'19" EAST 278.44 feet;
325) SOUTH 62°18'49" WEST 165.78 feet;
326) SOUTH 24°43'35" WEST 255.61 feet;
327) NORTH 74°35'53" WEST 128.61 feet;
328) NORTH 85°56'31" WEST 779.14 feet;
329) SOUTH 60°54'02" WEST 617.77 feet;
330) SOUTH 34°32'52" WEST 222.83 feet;
331) SOUTH 65°56'24" WEST 155.79 feet;
332) SOUTH 52°10'08" WEST 758.25 feet;
333) SOUTH 80°36'10" WEST 395.27 feet;
334) SOUTH 56°30'19" WEST 470.10 feet;
335) SOUTH 12°37'18" WEST 660.09 feet;
336) NORTH 83°08'11" WEST 259.11 feet;
337) SOUTH 80°59'15" WEST 1182.20 feet;
338) NORTH 49°15'09" EAST 3.69 feet;
339) NORTH 15°24'41" EAST 1096.60 feet;
340) NORTH 52°28'30" EAST 1104.33 feet;
341) NORTH 30°42'56" EAST 787.68 feet;
342) NORTH 02°35'09" EAST 535.56 feet;
343) NORTH 26°09'44" WEST 292.90 feet;
344) NORTH 42°45'39" EAST 227.73 feet;
345) NORTH 05°00'50" EAST 202.38 feet;
346) NORTH 14°28'51" WEST 481.76 feet;
347) NORTH 29°03'03" WEST 734.68 feet;
348) NORTH 52°42'56" WEST 664.43 feet;
349) NORTH 78°45'07" WEST 524.72 feet;
350) NORTH 56°11'27" WEST 963.57 feet;
351) NORTH 83°10'59" WEST 618.76 feet;
352) SOUTH 52°18'37" WEST 358.90 feet;
353) SOUTH 02°49'11" WEST 421.36 feet;
354) SOUTH 22°26'30" EAST 558.32 feet;
355) NORTH 53°49'48" WEST 522.72 feet;
356) SOUTH 85°18'58" WEST 191.92 feet;
357) NORTH 45°19'04" WEST 259.69 feet;
358) NORTH 68°38'55" WEST 173.26 feet;
359) NORTH 39°25'20" WEST 743.21 feet;
360) NORTH 59°00'44" WEST 220.00 feet;
361) SOUTH 85°39'29" WEST 355.03 feet;
362) SOUTH 53°10'16" WEST 228.97 feet;
363) SOUTH 83°19'43" WEST 205.32 feet;

364) NORTH 41°23'45" WEST 211.08 feet;
365) NORTH 60°07'19" WEST 210.66 feet;
366) SOUTH 84°52'16" WEST 302.46 feet;
367) NORTH 62°42'50" WEST 1460.32 feet;
368) NORTH 54°35'20" WEST 374.46 feet;
369) NORTH 62°35'25" WEST 848.58 feet;
370) NORTH 75°09'49" WEST 228.51 feet;
371) NORTH 81°34'28" WEST 500.77 feet;
372) SOUTH 89°09'26" WEST 1994.00 feet to a point, having grid coordinates of N 1,912,272.38, E 6,141,161.70, said point being SOUTH 60°25'59" EAST 7195.03 feet from NGS Monument "VASONA" (PID HS4911), being a 2.5-inch brass disc, punched and stamped "VASONA 1972", having grid coordinates of N 1,915,822.69, E 6,134,903.61;

373) SOUTH 55°44'40" WEST 588.87 feet;
374) NORTH 84°52'29" WEST 320.72 feet;
375) SOUTH 52°32'13" WEST 537.56 feet;
376) SOUTH 01°50'11" WEST 642.86 feet;
377) SOUTH 44°38'25" WEST 412.66 feet;
378) SOUTH 01°58'48" EAST 343.34 feet;
379) SOUTH 56°15'37" WEST 138.00 feet;
380) SOUTH 31°28'41" WEST 375.83 feet;
381) SOUTH 00°13'04" WEST 549.44 feet;
382) SOUTH 57°25'36" WEST 476.22 feet;
383) SOUTH 32°40'15" WEST 234.95 feet;
384) SOUTH 11°41'22" WEST 1265.17 feet;
385) SOUTH 26°46'29" WEST 361.82 feet;
386) NORTH 37°46'12" WEST 166.78 feet;
387) NORTH 51°39'45" WEST 294.37 feet;
388) NORTH 69°50'44" WEST 603.01 feet;
389) SOUTH 89°32'21" WEST 439.36 feet;
390) SOUTH 60°22'57" WEST 244.04 feet;
391) NORTH 15°18'03" WEST 246.53 feet;
392) NORTH 41°25'09" WEST 311.52 feet;
393) NORTH 76°19'56" WEST 405.22 feet;
394) SOUTH 55°42'19" WEST 419.33 feet;
395) SOUTH 17°55'56" WEST 501.90 feet;
396) SOUTH 04°58'59" EAST 647.89 feet;
397) SOUTH 26°32'05" WEST 188.80 feet;
398) SOUTH 02°43'39" WEST 412.97 feet;
399) SOUTH 42°07'33" WEST 498.71 feet;
400) NORTH 08°21'44" WEST 424.87 feet;
401) NORTH 45°42'44" EAST 302.11 feet;
402) NORTH 07°27'22" WEST 409.88 feet;
403) NORTH 05°36'32" EAST 308.84 feet;
404) NORTH 28°42'56" WEST 256.52 feet;
405) NORTH 54°18'58" WEST 757.31 feet to a point, having grid coordinates of N 1,908,067.07, E 6,134,663.97, said point being SOUTH 54°14'24" EAST 3915.47 feet from NGS Monument "J 1456" (PID HS5190), being a steel rod inside a monument well, rim encasement stamped "J 1456 1990", having grid coordinates of N 1,910,355.23, E 6,131,486.67;

406) **SOUTH 83°27'06" WEST 212.28 feet;**
407) **SOUTH 46°47'13" WEST 647.09 feet;**
408) **SOUTH 69°03'30" WEST 380.33 feet;**
409) **SOUTH 30°37'19" WEST 712.21 feet;**
410) **SOUTH 10°51'38" WEST 197.52 feet;**
411) **SOUTH 25°15'19" EAST 1277.82 feet;**
412) **SOUTH 46°16'54" EAST 382.38 feet;**
413) **SOUTH 72°19'17" EAST 392.31 feet;**
414) **SOUTH 12°01'35" EAST 221.29 feet;**
415) **SOUTH 44°42'44" WEST 258.36 feet;**
416) **NORTH 64°32'29" WEST 408.01 feet;**
417) **NORTH 40°10'22" WEST 518.10 feet;**
418) **NORTH 50°49'19" WEST 1153.57 feet;**
419) **NORTH 71°44'24" WEST 1849.03 feet;**
420) **NORTH 85°32'57" WEST 335.84 feet;**
421) **SOUTH 68°25'37" WEST 544.66 feet;**
422) **SOUTH 46°56'08" WEST 778.32 feet;**
423) **NORTH 21°49'25" WEST 232.18 feet;**
424) **NORTH 68°13'02" WEST 547.30 feet;**
425) **NORTH 05°32'32" WEST 557.84 feet;**
426) **NORTH 20°33'31" WEST 271.95 feet;**
427) **NORTH 45°52'59" EAST 379.00 feet;**
428) **NORTH 13°59'24" EAST 319.85 feet;**
429) **NORTH 09°35'00" WEST 638.30 feet;**
430) **NORTH 41°22'40" EAST 470.39 feet;**
431) **NORTH 15°27'31" EAST 623.49 feet;**
432) **NORTH 22°07'33" EAST 642.47 feet;**
433) **NORTH 41°25'59" EAST 1245.48 feet to a point, having grid coordinates of N 1,910,806.50, E 6,130,565.73, said point being NORTH 63°53'42" WEST 1025.56 feet from said NGS Monument "J 1456" (PID HS5190), having grid coordinates of N 1,910,355.23, E 6,131,486.67;**

434) **NORTH 10°45'40" EAST 686.65 feet;**
435) **NORTH 27°27'22" EAST 842.87 feet;**
436) **NORTH 39°16'26" EAST 1067.35 feet;**
437) **NORTH 51°36'51" EAST 651.66 feet;**
438) **NORTH 69°19'57" EAST 257.35 feet;**
439) **SOUTH 86°13'29" EAST 491.39 feet;**
440) **NORTH 49°29'59" EAST 265.43 feet;**
441) **NORTH 25°38'19" EAST 667.52 feet;**
442) **NORTH 35°09'15" EAST 514.18 feet;**
443) **NORTH 62°27'59" EAST 931.88 feet;**
444) **NORTH 10°34'33" EAST 830.07 feet to a point, having grid coordinates of N 1,915,959.73, E 6,134,765.54, said point being NORTH 45°12'55" WEST 194.53 feet from said NGS Monument "VASONA" (PID HS4911), having grid coordinates of N 1,915,822.69, E 6,134,903.61;**

445) **NORTH 04°28'10" WEST 848.34 feet;**
446) **NORTH 19°54'09" EAST 202.77 feet;**
447) **NORTH 59°30'15" EAST 589.40 feet;**

448) NORTH 72°01'22" EAST 146.74 feet;
449) NORTH 32°44'20" EAST 291.36 feet;
450) NORTH 14°57'32" WEST 343.71 feet;
451) NORTH 59°33'37" WEST 598.97 feet;
452) NORTH 32°42'08" WEST 503.11 feet;
453) NORTH 46°36'33" WEST 262.25 feet;
454) NORTH 14°57'02" WEST 332.03 feet;
455) NORTH 46°04'51" WEST 579.74 feet;
456) NORTH 78°58'44" WEST 265.85 feet;
457) NORTH 35°08'15" WEST 366.48 feet;
458) NORTH 59°19'34" WEST 797.81 feet;
459) NORTH 49°45'22" WEST 453.52 feet;
460) NORTH 70°56'28" WEST 246.47 feet;
461) NORTH 40°56'47" WEST 717.58 feet;
462) NORTH 77°38'46" WEST 390.16 feet;
463) SOUTH 59°57'37" WEST 758.16 feet;
464) NORTH 00°03'56" EAST 449.66 feet;
465) NORTH 42°59'40" WEST 574.01 feet;
466) NORTH 72°16'25" WEST 394.31 feet;
467) NORTH 88°02'02" WEST 152.54 feet;
468) NORTH 49°38'33" WEST 132.49 feet;
469) NORTH 62°44'18" WEST 479.19 feet;
470) SOUTH 86°43'55" WEST 412.66 feet;
471) SOUTH 59°18'54" WEST 405.84 feet;
472) SOUTH 31°38'57" WEST 148.46 feet;
473) NORTH 55°21'44" WEST 159.21 feet;
474) NORTH 12°50'55" WEST 233.65 feet;
475) NORTH 38°15'21" WEST 282.29 feet;
476) NORTH 65°44'25" WEST 276.01 feet;
477) SOUTH 63°35'26" WEST 420.04 feet;
478) SOUTH 27°10'52" WEST 716.32 feet;
479) SOUTH 17°46'28" EAST 466.91 feet;
480) SOUTH 23°41'52" WEST 268.75 feet;
481) SOUTH 05°08'59" WEST 518.86 feet;
482) SOUTH 28°44'31" WEST 383.69 feet;
483) NORTH 07°09'31" EAST 675.90 feet;
484) NORTH 25°24'44" WEST 497.77 feet;
485) NORTH 52°31'16" WEST 453.69 feet;
486) SOUTH 89°06'09" WEST 712.62 feet;
487) NORTH 20°49'45" WEST 737.38 feet;
488) NORTH 77°00'58" WEST 399.58 feet;
489) NORTH 49°52'42" WEST 921.81 feet;
490) NORTH 78°36'03" WEST 430.59 feet;
491) SOUTH 59°09'42" WEST 551.62 feet;
492) SOUTH 19°17'40" WEST 943.45 feet;
493) SOUTH 46°51'58" WEST 1172.37 feet;
494) SOUTH 23°35'05" WEST 2132.64 feet;
495) SOUTH 02°43'25" EAST 948.55 feet;
496) SOUTH 29°04'10" WEST 1124.88 feet;
497) SOUTH 03°00'37" WEST 217.87 feet;
498) SOUTH 25°09'56" WEST 417.32 feet;

499) **SOUTH 05°53'24" WEST 216.61 feet;**
500) **SOUTH 18°27'39" EAST 537.26 feet;**
501) **SOUTH 75°53'20" EAST 579.84 feet;**
502) **SOUTH 44°02'22" EAST 992.88 feet;**
503) **NORTH 89°42'54" EAST 979.32 feet;**
504) **SOUTH 68°55'45" EAST 389.72 feet;**
505) **NORTH 79°23'20" EAST 634.46 feet;**
506) **SOUTH 49°26'32" EAST 326.36 feet;**
507) **SOUTH 00°55'14" WEST 3219.64 feet to a point, having grid coordinates of N 1,911,511.01, E 6124361.84, said point being NORTH 80°47'09" WEST 7217.97 feet from said NGS Monument "J 1456" (PID HS5190), having grid coordinates of N 1,910,355.23, E 6,131,486.67;**

508) **SOUTH 43°23'59" WEST 708.90 feet;**
509) **NORTH 10°31'34" WEST 452.33 feet;**
510) **NORTH 50°38'11" WEST 188.46 feet;**
511) **NORTH 23°31'02" EAST 243.03 feet;**
512) **NORTH 06°37'09" EAST 826.98 feet;**
513) **NORTH 10°53'59" WEST 458.93 feet;**
514) **NORTH 39°23'06" WEST 373.92 feet;**
515) **NORTH 69°29'10" WEST 233.21 feet;**
516) **NORTH 40°46'44" WEST 172.91 feet;**
517) **NORTH 74°44'18" WEST 614.66 feet;**
518) **NORTH 54°01'16" WEST 1371.41 feet;**
519) **NORTH 89°25'24" WEST 584.46 feet;**
520) **SOUTH 63°48'20" WEST 1256.57 feet;**
521) **SOUTH 51°00'37" WEST 471.07 feet;**
522) **SOUTH 38°20'16" WEST 346.05 feet;**
523) **SOUTH 38°20'16" WEST 447.76 feet;**
524) **NORTH 09°31'04" WEST 393.94 feet;**
525) **NORTH 52°59'39" WEST 279.37 feet;**
526) **NORTH 12°31'59" EAST 933.82 feet;**
527) **NORTH 04°35'25" WEST 503.85 feet;**
528) **NORTH 22°05'42" WEST 1121.10 feet;**
529) **NORTH 40°35'50" WEST 281.79 feet;**
530) **NORTH 11°48'31" EAST 546.26 feet;**
531) **NORTH 23°03'45" WEST 458.37 feet;**
532) **NORTH 52°44'29" WEST 1443.70 feet;**
533) **NORTH 75°19'30" WEST 455.51 feet;**
534) **SOUTH 80°13'45" WEST 573.83 feet;**
535) **NORTH 33°02'16" WEST 1248.55 feet;**
536) **NORTH 55°49'54" WEST 463.81 feet;**
537) **SOUTH 83°13'04" WEST 739.24 feet;**
538) **SOUTH 50°18'59" WEST 268.65 feet;**
539) **NORTH 14°50'26" EAST 544.27 feet;**
540) **NORTH 01°05'54" EAST 930.97 feet to a point, having grid coordinates of N 1,920,633.39, E 6,114,108.10, said point being SOUTH 82°14'10" WEST 1805.00 feet from SCVWD Benchmark "BM161", being a 2-inch brass disc, punched and stamped "BM-161", having grid coordinates of N 1,920,877.23, E 6,115,896.55;**

541) NORTH 28°25'14” EAST 599.52 feet;
542) NORTH 13°09'42” WEST 275.30 feet;
543) NORTH 33°46'47” EAST 204.30 feet;
544) NORTH 07°50'14” EAST 324.50 feet;
545) NORTH 18°35'37” WEST 554.72 feet;
546) NORTH 43°13'21” WEST 109.72 feet;
547) NORTH 19°12'01” EAST 230.74 feet;
548) NORTH 00°58'39” WEST 1068.93 feet;
549) NORTH 65°12'25” EAST 637.46 feet;
550) NORTH 52°13'41” EAST 642.19 feet;
551) NORTH 23°08'44” EAST 740.23 feet;
552) NORTH 28°18'18” EAST 552.33 feet;
553) NORTH 25°28'00” EAST 358.46 feet;
554) NORTH 04°42'21” WEST 800.98 feet;
555) NORTH 24°29'55” WEST 487.68 feet;
556) NORTH 70°37'53” WEST 289.80 feet;
557) SOUTH 58°09'45” WEST 349.84 feet;
558) NORTH 30°50'27” WEST 585.23 feet;
559) NORTH 74°07'53” WEST 436.76 feet;
560) NORTH 24°05'07” WEST 395.75 feet;
561) NORTH 74°25'39” WEST 309.83 feet;
562) SOUTH 50°37'30” WEST 472.24 feet;
563) NORTH 01°07'09” EAST 493.25 feet;
564) NORTH 27°54'16” WEST 222.69 feet;
565) NORTH 45°02'26” EAST 897.16 feet;
566) NORTH 05°41'16” EAST 539.45 feet;
567) NORTH 18°29'55” WEST 381.13 feet;
568) NORTH 53°40'52” WEST 146.77 feet;
569) NORTH 07°20'12” WEST 405.31 feet;
570) NORTH 02°29'31” EAST 692.25 feet;
571) NORTH 19°21'38” WEST 639.57 feet;
572) NORTH 55°54'50” WEST 199.15 feet;
573) NORTH 08°50'50” EAST 294.98 feet;
574) NORTH 26°10'16” WEST 690.24 feet;
575) NORTH 42°06'24” WEST 795.86 feet;
576) NORTH 58°27'58” WEST 277.88 feet;
577) NORTH 26°17'41” WEST 250.89 feet;
578) NORTH 47°58'39” WEST 384.46 feet;
579) NORTH 65°36'25” WEST 462.35 feet;
580) NORTH 79°22'18” WEST 156.71 feet;
581) NORTH 50°47'48” WEST 146.76 feet;
582) NORTH 09°48'27” WEST 311.70 feet;
583) NORTH 47°18'28” WEST 615.32 feet;
584) NORTH 73°19'20” WEST 385.56 feet;
585) NORTH 17°47'35” WEST 123.69 feet;
586) NORTH 31°16'55” WEST 363.79 feet;
587) NORTH 48°32'44” WEST 342.51 feet;
588) NORTH 70°31'05” WEST 113.10 feet;
589) NORTH 16°46'13” WEST 219.93 feet;
590) NORTH 52°20'25” WEST 204.44 feet;
591) NORTH 10°01'04” WEST 401.71 feet;

592) NORTH 51°34'22" WEST 399.45 feet;
593) NORTH 01°37'21" WEST 207.12 feet;
594) NORTH 38°55'31" WEST 396.01 feet;
595) NORTH 51°00'12" WEST 562.42 feet;
596) NORTH 68°32'51" WEST 197.38 feet;
597) NORTH 33°45'59" WEST 130.83 feet;
598) NORTH 46°08'00" WEST 381.30 feet;
599) SOUTH 45°06'01" WEST 338.81 feet;
600) NORTH 39°05'06" WEST 339.94 feet;
601) NORTH 61°29'23" WEST 237.08 feet;
602) NORTH 25°32'04" EAST 344.52 feet;
603) NORTH 72°19'01" WEST 500.48 feet;
604) NORTH 82°30'06" WEST 228.16 feet;
605) SOUTH 68°03'47" WEST 308.82 feet;
606) NORTH 84°52'14" WEST 220.26 feet;
607) SOUTH 63°58'41" WEST 436.97 feet;
608) SOUTH 21°53'58" WEST 270.88 feet;
609) SOUTH 64°07'40" WEST 337.61 feet;
610) SOUTH 29°32'13" WEST 236.68 feet;
611) NORTH 37°15'09" WEST 185.39 feet;
612) NORTH 71°28'58" WEST 210.61 feet;
613) SOUTH 72°48'41" WEST 439.24 feet;
614) SOUTH 35°42'33" WEST 494.38 feet;
615) NORTH 33°03'51" WEST 212.60 feet;
616) NORTH 47°36'26" EAST 246.59 feet;
617) NORTH 09°48'13" EAST 260.34 feet;
618) NORTH 49°04'08" EAST 495.66 feet;
619) NORTH 05°28'59" EAST 238.54 feet;
620) NORTH 05°28'59" EAST 164.58 feet;
621) NORTH 83°30'51" EAST 221.48 feet;
622) SOUTH 73°15'21" EAST 418.05 feet;
623) NORTH 85°22'15" EAST 500.60 feet;
624) NORTH 46°52'16" EAST 366.41 feet;
625) NORTH 10°28'29" WEST 366.57 feet;
626) NORTH 51°10'27" WEST 284.13 feet;
627) NORTH 70°29'16" WEST 560.78 feet;
628) NORTH 54°52'27" WEST 693.21 feet;
629) NORTH 33°49'42" WEST 624.81 feet;
630) NORTH 48°31'09" WEST 399.62 feet;
631) NORTH 72°34'33" WEST 285.36 feet;
632) NORTH 03°10'07" EAST 240.56 feet;
633) NORTH 38°09'10" WEST 335.06 feet;
634) NORTH 09°55'47" WEST 218.32 feet;
635) NORTH 35°18'56" WEST 220.24 feet;
636) NORTH 09°38'12" EAST 346.50 feet;
637) NORTH 23°15'48" WEST 553.36 feet;
638) NORTH 49°13'50" WEST 295.85 feet;
639) NORTH 66°30'36" WEST 160.73 feet;
640) NORTH 16°55'55" WEST 375.09 feet to a point, having grid coordinates of N 1,943,567.73, E 6,103,198.69, said point being SOUTH 27°35'07" EAST 3902.22 feet from NGS Monument "HPGN D CA SAN ANTONIO" (PID

AA1871), being a 2-inch aluminum disc, punched and stamped "SAN ANTONIO HPGN-D 1992", having grid coordinates of N 1,947,026.36, E 6,101,391.70;

641) NORTH 84°27'22" EAST 467.20 feet;
642) NORTH 51°35'38" EAST 486.58 feet;
643) NORTH 11°32'09" EAST 698.23 feet;
644) NORTH 30°49'01" EAST 485.38 feet;
645) NORTH 01°07'14" WEST 210.06 feet;
646) NORTH 84°06'40" EAST 161.07 feet;
647) SOUTH 01°29'04" EAST 275.76 feet;
648) SOUTH 50°35'08" EAST 689.85 feet;
649) SOUTH 35°22'20" EAST 2237.55 feet;
650) SOUTH 02°35'49" EAST 1424.42 feet;
651) SOUTH 87°23'51" EAST 764.68 feet;
652) NORTH 14°33'25" EAST 1523.68 feet;
653) NORTH 21°11'18" WEST 267.76 feet;
654) NORTH 02°08'04" EAST 698.72 feet;
655) NORTH 27°25'45" WEST 166.82 feet;
656) NORTH 00°35'50" EAST 154.24 feet;
657) NORTH 32°51'51" WEST 278.39 feet;
658) NORTH 18°57'09" WEST 474.70 feet;
659) NORTH 07°17'27" EAST 339.00 feet;
660) NORTH 29°28'22" WEST 820.80 feet;
661) NORTH 40°04'35" WEST 918.69 feet;
662) NORTH 14°25'53" WEST 1213.86 feet;
663) NORTH 45°58'58" WEST 362.89 feet;
664) NORTH 35°48'13" EAST 524.80 feet;
665) NORTH 09°25'56" EAST 730.91 feet;
666) NORTH 21°16'48" WEST 203.89 feet;
667) NORTH 62°22'38" WEST 256.32 feet;
668) SOUTH 81°29'18" WEST 149.17 feet;
669) NORTH 27°30'29" WEST 256.65 feet;
670) NORTH 36°03'41" WEST 314.74 feet;
671) NORTH 39°30'51" WEST 634.15 feet;
672) NORTH 48°00'37" WEST 260.43 feet;
673) NORTH 37°03'47" WEST 180.54 feet;
674) NORTH 51°35'02" WEST 228.25 feet;
675) NORTH 56°24'29" WEST 195.42 feet;
676) NORTH 45°07'43" WEST 1438.46 feet;
677) NORTH 45°56'45" WEST 3790.62 feet to a point, having grid coordinates of N 1,954,459.66, E 6,100,552.37, said point being SOUTH 35°18'35" WEST 287.53 feet from NGS Monument "J 884" (PID HT1414), being a 2-inch brass disc, punched and stamped "SANTA CLARA VALLEY WATER DISCTRICT 1016R", having grid coordinates of N 1,954,694.30, E 6,100,718.56;

678) NORTH 52°39'14" WEST 584.58 feet;
679) NORTH 48°16'44" WEST 1084.66 feet;
680) NORTH 47°28'10" WEST 554.88 feet;
681) NORTH 39°36'53" WEST 586.11 feet;
682) NORTH 37°09'18" WEST 742.52 feet;

683) NORTH 44°19'13" WEST 4763.57 feet;
684) NORTH 45°44'30" WEST 3175.62 feet;
685) NORTH 45°33'31" WEST 109.21 feet;
686) NORTH 43°29'22" WEST 153.48 feet;
687) NORTH 40°42'43" WEST 192.66 feet;
688) NORTH 37°30'14" WEST 208.99 feet;
689) NORTH 33°26'34" WEST 284.68 feet to a point, having grid coordinates of N 1,963,316.02, E 6,091,851.05, said point being SOUTH 59°31'26" EAST 218.17 feet from NGS Monument "ALTOS RESET NO 3" (PID DB2762), being a 3-inch brass disc, punched and stamped "ALTOS 1957 NO 3 1972", having grid coordinates of N 1,963,426.68, E 6,091,663.02;

690) NORTH 30°54'14" WEST 2946.05 feet;
691) NORTH 32°25'47" EAST 275.82 feet;
692) NORTH 09°57'31" WEST 592.97 feet;
693) NORTH 23°18'54" EAST 227.55 feet;
694) NORTH 01°37'50" EAST 569.59 feet;
695) NORTH 15°45'31" WEST 895.33 feet;
696) NORTH 32°21'07" WEST 723.15 feet;
697) NORTH 63°36'42" WEST 487.44 feet;
698) NORTH 24°38'55" WEST 663.31 feet;
699) NORTH 00°54'53" WEST 395.05 feet;
700) NORTH 18°41'04" WEST 200.25 feet;
701) NORTH 44°06'42" WEST 281.68 feet;
702) NORTH 15°44'37" EAST 448.28 feet;
703) NORTH 58°05'09" EAST 267.34 feet;
704) NORTH 25°48'20" EAST 223.23 feet;
705) NORTH 00°41'46" WEST 360.43 feet;
706) NORTH 42°46'53" WEST 648.74 feet;
707) NORTH 19°51'27" WEST 272.78 feet to a point, having grid coordinates of N 1,972,384.89, E 6,088,787.73, said point being SOUTH 71°47'12" WEST 28640.17 feet from NGS Monument "ARC 34" (PID DG6881), being a 3.5-inch brass disc, punched and stamped "ARC 34", having grid coordinates of N 1,981,336.48, E 6,115,993.03;

708) NORTH 35°01'17" WEST 1032.11 feet;
709) NORTH 30°52'04" WEST 975.30 feet;
710) NORTH 54°23'25" WEST 396.16 feet;
711) NORTH 38°18'24" WEST 382.48 feet;
712) NORTH 68°10'50" WEST 360.63 feet;
713) NORTH 48°24'34" WEST 616.67 feet;
714) NORTH 17°13'02" WEST 674.26 feet;
715) NORTH 40°39'26" WEST 1830.96 feet;
716) NORTH 78°13'37" WEST 190.09 feet;
717) NORTH 41°06'45" WEST 68.56 feet;
718) NORTH 18°54'29" WEST 211.18 feet;
719) NORTH 46°35'00" WEST 959.07 feet;
720) NORTH 53°36'57" WEST 714.21 feet;
721) NORTH 85°29'03" WEST 429.26 feet;
722) NORTH 71°40'15" WEST 575.02 feet;
723) NORTH 63°31'52" WEST 1583.52 feet;

724) SOUTH 81°54'54” WEST 467.75 feet;
725) SOUTH 46°46'24” WEST 409.81 feet;
726) SOUTH 24°09'38” WEST 397.20 feet;
727) NORTH 61°34'21” WEST 793.63 feet;
728) NORTH 71°01'58” WEST 753.94 feet to a point, having grid coordinates of N 1,979,381.98, E 6,078,649.60, said point being NORTH 37°12'20" EAST 2557.57 feet from SCVWD Benchmark “BM484”, being a 2-inch brass disc, punched and stamped “BENCH MARK 484 2006”, having grid coordinates of N 1,977,344.94, E 6,077,103.10;

729) NORTH 44°00'57” WEST 995.00 feet;
730) NORTH 59°22'15” WEST 760.94 feet;
731) NORTH 84°40'03” WEST 211.22 feet;
732) NORTH 35°06'28” WEST 486.98 feet;
733) NORTH 64°04'13” WEST 753.48 feet;
734) NORTH 52°55'20” WEST 318.91 feet;
735) NORTH 69°35'10” WEST 188.16 feet;
736) SOUTH 78°45'00” WEST 153.97 feet;
737) SOUTH 55°18'30” WEST 280.93 feet;
738) NORTH 64°45'10” WEST 900.84 feet;
739) SOUTH 48°01'31” WEST 581.17 feet;
740) SOUTH 04°52'31” WEST 425.84 feet;
741) NORTH 74°30'45” WEST 200.94 feet;
742) SOUTH 77°07'45” WEST 359.75 feet;
743) NORTH 80°59'45” WEST 268.84 feet;
744) NORTH 84°46'26” WEST 592.14 feet;
745) SOUTH 74°48'33” WEST 324.67 feet;
746) NORTH 54°47'03” WEST 775.49 feet;
747) NORTH 86°15'00” WEST 210.92 feet;
748) SOUTH 58°07'30” WEST 190.48 feet;
749) SOUTH 24°22'30” WEST 190.48 feet;
750) SOUTH 03°45'05” EAST 189.07 feet;
751) NORTH 51°51'00” WEST 165.33 feet;
752) NORTH 51°39'11” WEST 93.10 feet;
753) NORTH 43°42'02” WEST 133.26 feet;
754) NORTH 43°37'25” WEST 81.39 feet;
755) NORTH 42°42'32” WEST 10.08 feet;
756) NORTH 70°16'19” WEST 19.31 feet;
757) NORTH 46°04'47” WEST 149.81 feet;
758) NORTH 32°57'43” WEST 65.44 feet;
759) NORTH 33°40'14” WEST 16.83 feet;
760) NORTH 23°05'59” WEST 71.02 feet;
761) NORTH 22°35'11” WEST 12.32 feet;
762) NORTH 29°51'04” WEST 13.58 feet;
763) NORTH 30°29'35” WEST 77.74 feet;
764) NORTH 30°32'07” WEST 26.07 feet;
765) NORTH 30°39'26” WEST 39.80 feet;
766) NORTH 16°14'42” WEST 161.30 feet;
767) NORTH 06°51'41” WEST 42.27 feet;
768) NORTH 05°02'34” EAST 54.02 feet;
769) NORTH 24°01'22” EAST 18.59 feet;

770) NORTH 23°17'49” EAST 44.46 feet;
771) NORTH 31°19'19” EAST 83.49 feet;
772) NORTH 46°02'37” EAST 271.40 feet;
773) NORTH 41°18'30” EAST 275.36 feet;
774) NORTH 36°22'01” EAST 100.42 feet;
775) NORTH 25°36'48” EAST 81.68 feet;
776) NORTH 18°50'32” EAST 27.53 feet;
777) NORTH 18°33'14” EAST 18.33 feet;
778) NORTH 04°35'49” WEST 100.61 feet;
779) NORTH 24°20'38” WEST 46.75 feet;
780) NORTH 37°32'15” WEST 86.62 feet;
781) NORTH 19°14'06” WEST 57.83 feet;
782) NORTH 05°00'42” WEST 46.87 feet;
783) NORTH 05°20'00” WEST 125.66 feet;
784) NORTH 05°27'54” WEST 15.39 feet;
785) NORTH 05°17'08” WEST 13.19 feet;
786) NORTH 01°02'03” EAST 34.23 feet;
787) NORTH 01°02'09” EAST 5.83 feet;
788) NORTH 07°41'04” WEST 105.35 feet;
789) NORTH 17°36'34” WEST 149.87 feet;
790) NORTH 08°15'55” EAST 16.15 feet;
791) NORTH 38°33'24” WEST 12.76 feet;
792) NORTH 10°00'53” WEST 271.19 feet;
793) NORTH 17°23'41” WEST 107.46 feet;
794) NORTH 10°21'20” WEST 105.85 feet;
795) NORTH 11°03'28” WEST 24.95 feet;
796) NORTH 01°43'55” WEST 120.30 feet;
797) NORTH 29°01'54” EAST 76.70 feet;
798) NORTH 50°16'12” EAST 36.80 feet;
799) NORTH 58°04'27” EAST 80.98 feet;
800) NORTH 70°29'48” EAST 74.73 feet;
801) NORTH 85°47'48” EAST 111.67 feet;
802) NORTH 85°38'32” EAST 81.37 feet;
803) NORTH 72°40'32” EAST 120.23 feet;
804) NORTH 64°23'44” EAST 71.46 feet;
805) NORTH 53°45'39” EAST 52.91 feet;
806) NORTH 38°50'38” EAST 136.88 feet;
807) NORTH 26°42'11” EAST 119.98 feet;
808) NORTH 12°34'12” EAST 171.31 feet;
809) NORTH 27°36'29” EAST 44.78 feet;
810) NORTH 44°03'32” EAST 43.83 feet;
811) NORTH 79°18'20” EAST 87.78 feet;
812) NORTH 76°45'52” EAST 171.37 feet;
813) NORTH 82°05'42” EAST 89.06 feet;
814) NORTH 74°30'34” EAST 168.99 feet;
815) NORTH 80°12'35” EAST 145.44 feet;
816) NORTH 80°10'58” EAST 88.99 feet;
817) NORTH 58°31'11” EAST 104.33 feet;
818) NORTH 52°38'04” EAST 99.66 feet;
819) NORTH 40°38'37” EAST 62.39 feet;
820) NORTH 30°42'08” EAST 344.88 feet;

821) NORTH 31°23'42" EAST 20.68 feet;
822) NORTH 30°35'48" EAST 62.37 feet;
823) NORTH 30°12'01" EAST 20.85 feet;
824) NORTH 25°44'49" EAST 49.30 feet;
825) NORTH 25°22'41" EAST 115.50 feet;
826) NORTH 16°43'15" EAST 33.28 feet;
827) NORTH 15°54'57" EAST 50.86 feet;
828) NORTH 16°19'18" EAST 52.85 feet;
829) NORTH 05°54'19" EAST 68.33 feet;
830) NORTH 00°47'10" WEST 64.11 feet;
831) NORTH 16°14'31" WEST 60.63 feet;
832) NORTH 41°02'46" WEST 59.36 feet;
833) NORTH 19°48'16" WEST 17.14 feet;
834) NORTH 04°54'05" EAST 60.21 feet;
835) NORTH 35°35'34" EAST 74.72 feet;
836) NORTH 35°18'38" EAST 109.28 feet;
837) NORTH 28°38'18" EAST 189.83 feet;
838) NORTH 14°21'09" EAST 61.74 feet;
839) NORTH 07°18'13" EAST 199.27 feet;
840) NORTH 17°05'01" EAST 224.68 feet;
841) NORTH 31°50'44" EAST 109.38 feet;
842) NORTH 41°28'22" EAST 55.50 feet;
843) NORTH 55°56'15" EAST 58.90 feet;
844) NORTH 70°59'46" EAST 70.15 feet;
845) SOUTH 83°15'42" EAST 40.26 feet;
846) SOUTH 65°23'10" EAST 50.05 feet;
847) SOUTH 43°07'30" EAST 86.27 feet;
848) SOUTH 61°13'10" EAST 57.08 feet;
849) SOUTH 61°16'20" EAST 42.30 feet;
850) SOUTH 81°06'59" EAST 117.23 feet;
851) NORTH 77°44'52" EAST 131.55 feet;
852) NORTH 57°00'41" EAST 96.32 feet;
853) NORTH 43°48'59" EAST 70.95 feet;
854) NORTH 34°39'37" EAST 79.15 feet;
855) NORTH 22°24'42" EAST 43.79 feet;
856) NORTH 22°09'20" EAST 50.74 feet;
857) NORTH 02°46'10" EAST 124.22 feet;
858) NORTH 29°23'51" WEST 78.54 feet;
859) NORTH 34°22'54" WEST 127.77 feet;
860) NORTH 21°53'32" WEST 26.09 feet;
861) NORTH 04°39'27" EAST 32.11 feet;
862) NORTH 52°09'04" EAST 15.66 feet;
863) NORTH 74°13'10" EAST 41.55 feet;
864) SOUTH 89°43'42" EAST 82.75 feet;
865) NORTH 89°38'49" EAST 45.30 feet;
866) SOUTH 81°30'17" EAST 123.27 feet;
867) NORTH 89°50'13" EAST 105.12 feet;
868) NORTH 89°47'50" EAST 84.79 feet;
869) NORTH 77°57'08" EAST 88.52 feet;
870) NORTH 70°34'57" EAST 145.93 feet;
871) NORTH 70°24'30" EAST 58.94 feet;

872) NORTH 62°20'34" EAST 49.31 feet;
873) NORTH 40°38'39" EAST 61.92 feet;
874) NORTH 40°14'05" EAST 121.70 feet;
875) SOUTH 87°53'05" EAST 57.49 feet;
876) SOUTH 88°12'48" EAST 54.87 feet;
877) NORTH 86°32'40" EAST 9.32 feet;
878) NORTH 85°48'04" EAST 27.99 feet;
879) NORTH 84°06'19" EAST 9.07 feet;
880) NORTH 71°06'36" EAST 27.79 feet;
881) NORTH 70°55'00" EAST 42.36 feet;
882) NORTH 58°43'25" EAST 42.25 feet;
883) NORTH 58°03'15" EAST 10.04 feet;
884) NORTH 27°09'42" EAST 21.09 feet;
885) NORTH 26°54'54" EAST 18.62 feet;
886) NORTH 25°31'19" EAST 11.20 feet;
887) NORTH 07°19'33" EAST 47.62 feet;
888) NORTH 06°55'36" EAST 19.77 feet;
889) NORTH 07°11'48" EAST 43.21 feet;
890) NORTH 18°27'48" EAST 100.75 feet;
891) NORTH 09°51'17" EAST 28.37 feet;
892) NORTH 07°54'49" EAST 12.10 feet;
893) NORTH 24°31'49" EAST 30.57 feet;
894) NORTH 45°10'27" EAST 11.67 feet;
895) NORTH 43°18'59" EAST 34.95 feet;
896) NORTH 41°45'26" EAST 12.01 feet;
897) NORTH 43°38'24" EAST 12.86 feet;
898) NORTH 43°16'33" EAST 38.86 feet;
899) NORTH 41°36'10" EAST 12.94 feet;
900) NORTH 43°40'20" EAST 28.71 feet;
901) NORTH 42°55'04" EAST 23.48 feet;
902) NORTH 36°49'11" EAST 51.62 feet;
903) NORTH 23°54'37" EAST 13.44 feet;
904) NORTH 23°00'35" EAST 31.02 feet;
905) NORTH 23°15'52" EAST 76.71 feet;
906) NORTH 01°01'31" EAST 37.87 feet;
907) NORTH 42°08'37" WEST 8.49 feet;
908) NORTH 02°13'04" WEST 71.84 feet;
909) NORTH 14°38'45" EAST 144.24 feet;
910) NORTH 28°13'14" EAST 92.11 feet;
911) NORTH 45°28'44" EAST 157.11 feet;
912) NORTH 56°17'46" EAST 231.37 feet;
913) NORTH 47°23'49" EAST 110.29 feet;
914) NORTH 36°47'21" EAST 78.98 feet;
915) NORTH 42°25'20" EAST 248.03 feet;
916) NORTH 48°02'00" EAST 117.47 feet;
917) NORTH 33°16'03" EAST 146.37 feet;
918) NORTH 41°08'59" EAST 50.00 feet;
919) NORTH 49°22'27" EAST 42.74 feet;
920) NORTH 52°08'42" EAST 5.22 feet;
921) NORTH 62°30'49" EAST 41.96 feet;
922) NORTH 63°25'50" EAST 7.86 feet;

923) NORTH 70°55'45" EAST 22.26 feet;
924) NORTH 70°54'24" EAST 34.93 feet;
925) NORTH 88°03'37" EAST 119.76 feet;
926) NORTH 81°29'59" EAST 46.21 feet;
927) NORTH 68°35'44" EAST 73.49 feet;
928) NORTH 51°55'12" EAST 93.52 feet;
929) NORTH 52°00'29" EAST 60.15 feet;
930) NORTH 48°21'47" EAST 276.72 feet;
931) NORTH 76°08'12" EAST 45.36 feet;
932) NORTH 75°17'49" EAST 14.78 feet;
933) SOUTH 62°06'12" EAST 32.22 feet;
934) SOUTH 24°47'53" EAST 105.98 feet;
935) SOUTH 24°56'21" EAST 53.05 feet;
936) NORTH 15°00'44" EAST 42.03 feet;
937) SOUTH 45°39'01" EAST 43.47 feet;
938) SOUTH 45°39'01" EAST 4.82 feet;
939) NORTH 28°10'54" EAST 182.52 feet;
940) NORTH 41°18'13" EAST 227.19 feet;
941) NORTH 31°25'12" EAST 89.49 feet;
942) NORTH 22°27'37" EAST 131.04 feet;
943) NORTH 13°43'41" EAST 73.90 feet;
944) NORTH 01°01'15" EAST 32.04 feet;
945) NORTH 24°24'01" WEST 41.93 feet;
946) NORTH 40°58'16" WEST 30.37 feet;
947) NORTH 40°43'50" WEST 44.90 feet;
948) NORTH 19°30'30" WEST 51.32 feet;
949) NORTH 05°16'16" WEST 34.43 feet;
950) NORTH 02°11'17" EAST 99.79 feet;
951) NORTH 11°09'10" EAST 193.07 feet;
952) NORTH 20°23'16" EAST 120.80 feet;
953) NORTH 44°38'56" EAST 69.42 feet;
954) NORTH 74°59'48" EAST 64.63 feet;
955) SOUTH 78°37'15" EAST 58.72 feet;
956) SOUTH 78°20'26" EAST 61.14 feet;
957) SOUTH 46°18'30" EAST 32.77 feet;
958) SOUTH 60°47'46" EAST 33.92 feet;
959) SOUTH 49°36'47" EAST 59.70 feet;
960) SOUTH 67°27'03" EAST 38.69 feet;
961) SOUTH 88°58'48" EAST 67.93 feet;
962) NORTH 71°18'18" EAST 10.79 feet;
963) NORTH 67°08'28" EAST 10.79 feet;
964) NORTH 49°21'25" EAST 45.46 feet;
965) NORTH 34°19'08" EAST 69.27 feet;
966) NORTH 16°05'30" EAST 84.84 feet;
967) NORTH 23°58'57" EAST 56.55 feet;
968) NORTH 08°28'37" EAST 123.02 feet;
969) NORTH 17°21'06" EAST 114.58 feet;
970) NORTH 06°30'55" EAST 42.43 feet;
971) NORTH 16°19'09" EAST 77.01 feet;
972) NORTH 09°53'54" EAST 218.17 feet;
973) NORTH 32°29'12" EAST 42.26 feet;

974) NORTH 52°44'44" EAST 22.92 feet;
975) SOUTH 88°58'50" EAST 27.87 feet;
976) SOUTH 71°34'11" EAST 60.84 feet;
977) SOUTH 50°50'35" EAST 48.35 feet;
978) SOUTH 35°06'35" EAST 37.42 feet;
979) SOUTH 50°19'31" EAST 51.30 feet;
980) SOUTH 38°59'03" EAST 99.34 feet;
981) SOUTH 69°01'29" EAST 23.47 feet;
982) NORTH 80°41'23" EAST 34.52 feet;
983) NORTH 60°03'33" EAST 46.71 feet;
984) NORTH 26°46'39" EAST 30.73 feet;
985) NORTH 26°49'10" EAST 38.02 feet;
986) NORTH 11°57'25" EAST 12.24 feet;
987) NORTH 10°39'39" EAST 22.53 feet;
988) NORTH 30°12'01" EAST 82.16 feet;
989) NORTH 53°28'43" EAST 40.63 feet;
990) NORTH 50°02'56" EAST 5.00 feet;
991) NORTH 71°22'32" EAST 37.91 feet;
992) NORTH 71°03'27" EAST 115.19 feet;
993) NORTH 25°36'28" EAST 132.54 feet;
994) NORTH 20°09'22" EAST 98.28 feet;
995) NORTH 21°48'22" EAST 16.36 feet;
996) NORTH 85°36'33" EAST 15.45 feet;
997) NORTH 87°36'05" EAST 6.11 feet;
998) NORTH 86°29'51" EAST 69.30 feet;
999) NORTH 69°22'02" EAST 24.67 feet;
1000) SOUTH 74°53'57" EAST 261.86 feet;
1001) NORTH 88°38'34" EAST 105.46 feet;
1002) NORTH 66°10'12" EAST 68.45 feet;
1003) NORTH 52°55'16" EAST 50.16 feet;
1004) NORTH 35°10'23" EAST 20.68 feet;
1005) NORTH 15°40'51" EAST 49.30 feet;
1006) NORTH 05°46'18" WEST 81.04 feet;
1007) NORTH 01°51'45" EAST 39.33 feet;
1008) NORTH 04°21'18" EAST 29.91 feet;
1009) NORTH 27°32'52" EAST 40.29 feet;
1010) NORTH 56°01'42" EAST 13.82 feet;
1011) NORTH 56°01'42" EAST 35.07 feet;
1012) NORTH 71°35'02" EAST 29.55 feet;
1013) NORTH 87°34'19" EAST 266.66 feet;
1014) SOUTH 75°03'51" EAST 74.16 feet;
1015) SOUTH 62°28'39" EAST 26.92 feet;
1016) SOUTH 40°35'58" EAST 51.14 feet;
1017) SOUTH 29°22'14" EAST 51.07 feet;
1018) SOUTH 06°45'34" EAST 133.03 feet;
1019) SOUTH 18°47'23" EAST 100.23 feet;
1020) SOUTH 43°56'33" EAST 50.94 feet;
1021) SOUTH 59°14'23" EAST 60.18 feet;
1022) SOUTH 78°50'16" EAST 239.74 feet;
1023) NORTH 76°02'44" EAST 132.51 feet;
1024) NORTH 43°29'02" EAST 26.65 feet;

1025) NORTH 02°07'56” EAST 104.15 feet;
1026) NORTH 20°11'18” EAST 36.24 feet;
1027) NORTH 35°52'07” EAST 38.60 feet;
1028) NORTH 58°32'49” EAST 71.22 feet;
1029) NORTH 85°49'39” EAST 44.30 feet;
1030) SOUTH 76°26'21” EAST 129.06 feet;
1031) SOUTH 82°38'12” EAST 36.22 feet;
1032) SOUTH 70°09'26” EAST 31.59 feet;
1033) NORTH 86°05'58” EAST 72.25 feet;
1034) NORTH 54°29'34” EAST 29.98 feet;
1035) NORTH 29°00'10” EAST 27.21 feet;
1036) NORTH 28°16'27” EAST 33.59 feet;
1037) NORTH 14°35'42” EAST 24.72 feet;
1038) NORTH 04°43'09” WEST 98.80 feet;
1039) NORTH 14°43'52” WEST 31.02 feet;
1040) NORTH 15°24'29” WEST 62.63 feet;
1041) NORTH 25°42'39” WEST 7.75 feet;
1042) NORTH 25°09'55” WEST 24.34 feet;
1043) NORTH 26°22'43” WEST 8.20 feet;
1044) NORTH 08°14'52” WEST 48.70 feet;
1045) NORTH 22°01'13” WEST 5.93 feet;
1046) NORTH 22°40'29” WEST 59.24 feet;
1047) NORTH 12°08'17” WEST 43.37 feet;
1048) NORTH 06°33'25” EAST 42.07 feet;
1049) NORTH 37°59'26” EAST 16.41 feet;
1050) NORTH 36°28'47” EAST 21.01 feet;
1051) NORTH 54°24'39” EAST 27.48 feet;
1052) NORTH 55°55'37” EAST 17.74 feet;
1053) NORTH 68°19'20” EAST 31.15 feet;
1054) NORTH 70°52'39” EAST 20.10 feet;
1055) NORTH 69°49'15” EAST 17.12 feet;
1056) NORTH 88°10'04” EAST 124.68 feet;
1057) NORTH 87°42'32” EAST 69.49 feet;
1058) NORTH 73°55'46” EAST 121.46 feet;
1059) NORTH 49°13'39” EAST 147.54 feet;
1060) NORTH 40°57'59” EAST 56.05 feet;
1061) NORTH 40°36'31” EAST 125.69 feet;
1062) NORTH 38°43'05” EAST 15.19 feet;
1063) NORTH 39°34'20” EAST 9.78 feet;
1064) NORTH 38°13'09” EAST 28.80 feet;
1065) NORTH 36°56'34” EAST 9.89 feet;
1066) NORTH 38°21'24” EAST 32.06 feet;
1067) NORTH 43°09'17” EAST 18.17 feet;
1068) NORTH 41°58'10” EAST 124.87 feet;
1069) NORTH 33°25'46” EAST 25.45 feet;
1070) NORTH 32°46'54” EAST 51.82 feet;
1071) NORTH 32°53'00” EAST 153.92 feet;
1072) NORTH 52°50'39” EAST 58.33 feet;
1073) SOUTH 85°03'40” EAST 58.48 feet;
1074) SOUTH 68°21'56” EAST 40.32 feet;
1075) SOUTH 41°30'05” EAST 29.64 feet;

1076) SOUTH 25°36'40" EAST 53.76 feet;
1077) SOUTH 10°51'43" EAST 67.72 feet;
1078) SOUTH 25°28'21" EAST 35.80 feet;
1079) SOUTH 40°10'24" EAST 39.67 feet;
1080) SOUTH 66°53'58" EAST 21.30 feet;
1081) NORTH 77°31'00" EAST 205.96 feet;
1082) NORTH 88°06'55" EAST 72.08 feet;
1083) SOUTH 81°03'57" EAST 206.02 feet;
1084) SOUTH 81°29'10" EAST 58.55 feet;
1085) SOUTH 87°58'52" EAST 186.08 feet;
1086) SOUTH 87°54'35" EAST 77.22 feet;
1087) SOUTH 88°04'19" EAST 90.86 feet;
1088) SOUTH 72°06'30" EAST 75.23 feet;
1089) SOUTH 53°48'20" EAST 48.66 feet;
1090) SOUTH 62°30'48" EAST 22.05 feet;
1091) SOUTH 62°16'35" EAST 54.27 feet;
1092) SOUTH 44°12'45" EAST 27.40 feet;
1093) SOUTH 44°00'08" EAST 78.80 feet;
1094) SOUTH 44°03'09" EAST 18.04 feet;
1095) SOUTH 58°28'07" EAST 67.39 feet;
1096) SOUTH 75°12'07" EAST 41.24 feet;
1097) NORTH 85°48'29" EAST 92.39 feet;
1098) NORTH 85°02'27" EAST 14.01 feet;
1099) NORTH 78°57'48" EAST 57.58 feet;
1100) NORTH 78°50'04" EAST 46.62 feet;
1101) NORTH 69°48'29" EAST 94.64 feet;
1102) NORTH 62°09'12" EAST 35.46 feet;
1103) NORTH 61°03'02" EAST 49.58 feet;
1104) NORTH 48°06'09" EAST 76.48 feet;
1105) NORTH 22°14'15" EAST 76.95 feet;
1106) NORTH 02°45'50" EAST 66.30 feet;
1107) NORTH 14°24'31" WEST 60.05 feet;
1108) NORTH 02°16'16" EAST 92.14 feet;
1109) NORTH 27°54'21" EAST 35.93 feet;
1110) NORTH 49°52'32" EAST 60.89 feet;
1111) NORTH 65°50'41" EAST 77.93 feet;
1112) NORTH 65°47'38" EAST 114.53 feet;
1113) NORTH 74°28'07" EAST 62.68 feet;
1114) NORTH 89°42'02" EAST 79.84 feet;
1115) SOUTH 78°51'25" EAST 124.13 feet;
1116) SOUTH 72°19'19" EAST 181.49 feet;
1117) NORTH 88°58'30" EAST 164.39 feet;
1118) SOUTH 79°38'50" EAST 147.96 feet;
1119) SOUTH 70°53'10" EAST 71.46 feet;
1120) SOUTH 57°44'51" EAST 114.41 feet;
1121) SOUTH 70°52'28" EAST 49.17 feet;
1122) SOUTH 67°06'37" EAST 286.21 feet;
1123) SOUTH 53°23'34" EAST 78.18 feet;
1124) SOUTH 65°56'03" WEST 116.00 feet;
1125) SOUTH 40°46'22" EAST 28.32 feet;
1126) SOUTH 41°11'48" EAST 39.32 feet;

1127) SOUTH 32°24'38" EAST 12.65 feet;
1128) SOUTH 32°12'48" EAST 36.56 feet;
1129) SOUTH 32°12'47" EAST 12.19 feet;
1130) SOUTH 32°59'48" EAST 11.42 feet;
1131) SOUTH 32°06'34" EAST 33.47 feet;
1132) SOUTH 32°48'11" EAST 10.96 feet;
1133) SOUTH 33°13'57" EAST 18.06 feet;
1134) SOUTH 31°43'52" EAST 13.42 feet;
1135) SOUTH 37°53'16" EAST 39.30 feet;
1136) SOUTH 37°33'26" EAST 32.59 feet;
1137) SOUTH 37°33'25" EAST 30.73 feet;
1138) SOUTH 26°38'40" EAST 14.39 feet;
1139) SOUTH 27°18'16" EAST 15.30 feet;
1140) SOUTH 26°59'04" EAST 16.08 feet;
1141) SOUTH 26°16'54" EAST 27.86 feet;
1142) SOUTH 26°43'54" EAST 19.33 feet;
1143) SOUTH 26°40'18" EAST 15.62 feet;
1144) SOUTH 26°45'35" EAST 21.81 feet;
1145) SOUTH 26°51'05" EAST 36.65 feet;
1146) SOUTH 31°01'17" EAST 27.92 feet;
1147) SOUTH 30°43'16" EAST 20.98 feet;
1148) SOUTH 30°45'13" EAST 36.40 feet;
1149) SOUTH 30°50'13" EAST 77.58 feet;
1150) SOUTH 35°51'05" EAST 30.49 feet;
1151) SOUTH 35°40'00" EAST 108.10 feet;
1152) SOUTH 35°38'21" EAST 35.79 feet;
1153) SOUTH 45°57'34" EAST 158.45 feet;
1154) SOUTH 55°16'02" EAST 108.20 feet;
1155) SOUTH 66°38'44" EAST 132.13 feet;
1156) SOUTH 78°51'59" EAST 101.43 feet;
1157) SOUTH 74°35'01" EAST 330.57 feet;
1158) SOUTH 70°45'51" EAST 60.51 feet;
1159) SOUTH 70°25'35" EAST 34.30 feet;
1160) SOUTH 59°14'07" EAST 181.90 feet;
1161) SOUTH 89°42'11" EAST 148.05 feet;
1162) NORTH 84°34'12" EAST 126.78 feet;
1163) NORTH 72°58'27" EAST 250.61 feet;
1164) NORTH 79°47'17" EAST 114.22 feet;
1165) SOUTH 86°39'19" EAST 97.90 feet;
1166) SOUTH 76°32'37" EAST 47.27 feet;
1167) SOUTH 56°46'40" EAST 139.30 feet;
1168) SOUTH 79°41'03" EAST 184.43 feet;
1169) SOUTH 70°26'30" EAST 82.37 feet;
1170) SOUTH 47°01'04" EAST 107.78 feet;
1171) SOUTH 22°30'09" EAST 69.88 feet;
1172) SOUTH 30°12'13" EAST 65.56 feet;
1173) SOUTH 38°27'12" EAST 43.85 feet;
1174) SOUTH 78°41'41" EAST 179.09 feet;
1175) SOUTH 83°37'16" EAST 6.80 feet;
1176) SOUTH 83°37'19" EAST 71.70 feet;
1177) SOUTH 83°37'15" EAST 92.35 feet;

1178) SOUTH 74°10'21" EAST 86.78 feet;

1179) SOUTH 56°34'10" EAST 52.28 feet;

1180) SOUTH 38°05'01" EAST 275.81 feet;

1181) SOUTH 13°53'05" EAST 14.69 feet;

1182) SOUTH 67°14'46" EAST 6.88 feet;

1183) SOUTH 20°10'13" EAST 27.33 feet;

1184) SOUTH 34°10'17" EAST 107.34 feet;

1185) SOUTH 37°43'43" EAST 79.81 feet;

1186) SOUTH 59°14'12" EAST 64.54 feet;

1187) SOUTH 72°53'25" EAST 49.85 feet;

1188) NORTH 86°16'47" EAST 22.14 feet;

1189) NORTH 84°03'13" EAST 30.12 feet;

1190) NORTH 46°37'59" EAST 116.12 feet;

1191) NORTH 06°41'16" EAST 161.00 feet;

1192) NORTH 06°47'25" EAST 20.13 feet;

1193) NORTH 25°32'17" EAST 44.03 feet;

1194) NORTH 25°36'16" EAST 18.82 feet;

1195) NORTH 25°56'13" EAST 9.64 feet;

1196) NORTH 25°04'16" EAST 36.29 feet;

1197) NORTH 26°00'49" EAST 49.42 feet;

1198) NORTH 20°30'22" EAST 3.48 feet;

1199) NORTH 44°00'32" EAST 23.40 feet;

1200) NORTH 44°55'36" EAST 12.13 feet;

1201) NORTH 43°51'57" EAST 36.27 feet;

1202) NORTH 42°45'28" EAST 12.20 feet;

1203) NORTH 44°31'27" EAST 47.21 feet;

1204) NORTH 43°58'00" EAST 135.85 feet;

1205) SOUTH 89°00'25" EAST 5.22 feet;

1206) NORTH 87°31'51" EAST 42.17 feet;

1207) NORTH 87°07'03" EAST 32.29 feet;

1208) NORTH 87°44'38" EAST 166.88 feet;

1209) SOUTH 59°47'30" EAST 55.21 feet;

1210) SOUTH 65°54'16" EAST 141.06 feet;

1211) SOUTH 49°54'48" EAST 105.09 feet;

1212) SOUTH 88°22'08" EAST 32.80 feet;

1213) SOUTH 59°50'11" EAST 205.44 feet;

1214) SOUTH 88°26'38" EAST 74.31 feet;

1215) SOUTH 88°26'15" EAST 73.44 feet;

1216) NORTH 66°31'56" EAST 271.70 feet;

1217) NORTH 80°12'11" EAST 83.63 feet;

1218) NORTH 62°24'20" EAST 168.92 feet;

1219) NORTH 46°29'48" EAST 97.67 feet;

1220) NORTH 46°44'24" EAST 41.74 feet;

1221) NORTH 28°06'49" EAST 73.23 feet;

1222) NORTH 08°51'14" EAST 65.79 feet;

1223) NORTH 08°21'33" EAST 40.75 feet;

1224) NORTH 04°59'15" WEST 114.22 feet;

1225) NORTH 12°16'10" WEST 43.02 feet;

1226) NORTH 12°33'29" WEST 16.10 feet;

1227) NORTH 01°15'27" WEST 51.74 feet;

1228) NORTH 25°02'28" WEST 483.43 feet;

1229) NORTH 25°22'02" WEST 30.07 feet;
1230) NORTH 00°34'57" WEST 443.29 feet;
1231) NORTH 13°58'29" WEST 306.79 feet;
1232) NORTH 01°25'44" EAST 114.70 feet;
1233) NORTH 29°23'46" WEST 95.82 feet;
1234) NORTH 01°36'09" EAST 81.93 feet;
1235) NORTH 32°17'26" WEST 59.24 feet;
1236) NORTH 12°29'25" WEST 372.18 feet;
1237) NORTH 12°27'20" WEST 33.69 feet;
1238) NORTH 01°34'20" EAST 115.06 feet;
1239) NORTH 43°46'33" WEST 46.16 feet;
1240) NORTH 12°37'19" WEST 67.81 feet;
1241) NORTH 01°36'07" EAST 164.22 feet to a point, having grid coordinates of N 1,994,457.20, E 6,090,366.73, said point being NORTH 47°45'31" WEST 4494.11 feet from NGS Monument "941 4537 TIDAL 4 RESET" (PID HT1271), being a 3.5-inch brass disc, punched and stamped "TIDAL RESET 1970", having grid coordinates of N 1,991,436.02, E 6,093,693.81;

1242) NORTH 58°20'21" EAST 31.72 feet;
1243) NORTH 58°53'46" EAST 31.52 feet;
1244) NORTH 60°38'53" EAST 55.49 feet;
1245) NORTH 46°09'02" EAST 45.44 feet;
1246) NORTH 55°41'19" EAST 66.15 feet;
1247) NORTH 54°16'53" EAST 116.94 feet;
1248) NORTH 53°07'05" EAST 147.08 feet;
1249) NORTH 56°01'41" EAST 104.83 feet;
1250) NORTH 51°31'53" EAST 251.50 feet;
1251) NORTH 52°20'34" EAST 1157.24 feet;
1252) NORTH 52°40'31" EAST 361.76 feet;
1253) NORTH 57°49'44" EAST 33.28 feet;
1254) NORTH 66°59'08" EAST 83.24 feet;
1255) NORTH 68°05'17" EAST 154.38 feet;
1256) NORTH 74°08'57" EAST 95.52 feet;
1257) NORTH 36°36'23" EAST 35.38 feet;
1258) NORTH 35°50'05" EAST 35.05 feet;
1259) NORTH 36°03'57" EAST 37.37 feet;
1260) NORTH 35°44'51" EAST 37.67 feet;
1261) NORTH 35°57'33" EAST 134.19 feet;
1262) NORTH 86°03'42" EAST 122.93 feet;
1263) NORTH 51°05'11" EAST 778.19 feet;
1264) SOUTH 40°53'45" EAST 3.91 feet;
1265) SOUTH 42°14'42" EAST 38.98 feet;
1266) SOUTH 42°22'03" EAST 116.68 feet;
1267) SOUTH 42°18'06" EAST 38.52 feet;
1268) SOUTH 42°18'08" EAST 352.15 feet;
1269) SOUTH 52°44'28" EAST 38.16 feet;
1270) SOUTH 70°47'07" EAST 97.78 feet;
1271) SOUTH 88°05'21" EAST 90.27 feet;
1272) SOUTH 88°16'17" EAST 673.95 feet;
1273) SOUTH 88°17'06" EAST 3581.93 feet;
1274) SOUTH 72°03'08" EAST 44.91 feet;

1275) SOUTH 04°46'34" WEST 13.14 feet;
1276) SOUTH 04°58'56" WEST 1433.71 feet;
1277) SOUTH 01°22'24" EAST 84.91 feet;
1278) NORTH 38°23'45" EAST 1460.62 feet;
1279) NORTH 38°23'02" EAST 4382.31 feet;
1280) NORTH 38°21'57" EAST 1460.64 feet;
1281) SOUTH 50°40'19" EAST 897.05 feet;
1282) SOUTH 50°40'14" EAST 2443.92 feet;
1283) NORTH 40°56'02" WEST 44.37 feet;
1284) SOUTH 50°38'44" EAST 1284.85 feet;
1285) SOUTH 46°53'11" EAST 50.41 feet;
1286) SOUTH 50°44'13" EAST 5533.23 feet;
1287) SOUTH 48°47'23" EAST 95.24 feet;
1288) SOUTH 49°47'22" EAST 95.24 feet;
1289) SOUTH 50°47'23" EAST 95.24 feet;
1290) SOUTH 51°47'22" EAST 95.24 feet;
1291) SOUTH 53°02'25" EAST 142.97 feet;
1292) SOUTH 53°19'25" EAST 64.36 feet;
1293) SOUTH 54°19'26" EAST 64.36 feet;
1294) SOUTH 55°19'26" EAST 64.36 feet;
1295) SOUTH 56°19'25" EAST 64.36 feet;
1296) SOUTH 57°26'46" EAST 74.09 feet;
1297) SOUTH 65°02'06" EAST 118.23 feet;
1298) SOUTH 80°44'28" EAST 141.09 feet;
1299) SOUTH 80°57'33" EAST 131.93 feet;
1300) SOUTH 89°03'05" EAST 389.81 feet;
1301) NORTH 84°17'39" EAST 229.39 feet;
1302) NORTH 84°11'27" EAST 63.12 feet;
1303) NORTH 65°54'28" EAST 49.78 feet;
1304) NORTH 64°54'29" EAST 63.23 feet;
1305) NORTH 63°54'29" EAST 63.23 feet;
1306) NORTH 62°54'28" EAST 63.23 feet;
1307) NORTH 61°40'52" EAST 91.91 feet;
1308) NORTH 63°02'29" EAST 45.92 feet;
1309) NORTH 62°02'29" EAST 45.92 feet;
1310) NORTH 61°02'29" EAST 45.92 feet;
1311) NORTH 60°02'28" EAST 45.92 feet;
1312) NORTH 59°02'29" EAST 45.92 feet;
1313) NORTH 58°02'31" EAST 45.92 feet;
1314) NORTH 57°02'29" EAST 45.92 feet;
1315) NORTH 56°02'29" EAST 45.92 feet;
1316) NORTH 55°02'28" EAST 17.56 feet;
1317) NORTH 01°37'35" EAST 26.55 feet;
1318) NORTH 56°06'13" EAST 1314.65 feet;
1319) NORTH 89°06'03" EAST 10.21 feet;
1320) NORTH 53°00'14" EAST 112.70 feet;
1321) NORTH 52°13'50" EAST 397.63 feet;
1322) NORTH 58°22'52" EAST 801.68 feet;
1323) NORTH 58°24'28" EAST 101.55 feet;
1324) NORTH 59°50'29" EAST 274.21 feet;
1325) NORTH 73°46'09" EAST 329.29 feet;

1326) NORTH 86°33'04" EAST 399.65 feet;
1327) NORTH 85°45'56" EAST 306.86 feet;
1328) NORTH 87°01'03" EAST 612.36 feet;
1329) NORTH 87°49'39" EAST 510.10 feet;
1330) NORTH 85°47'55" EAST 618.05 feet;
1331) NORTH 86°09'34" EAST 266.77 feet;
1332) NORTH 85°56'04" EAST 417.77 feet;
1333) SOUTH 79°59'09" EAST 475.25 feet;
1334) SOUTH 73°58'30" EAST 96.49 feet;
1335) SOUTH 74°05'06" EAST 288.72 feet;
1336) SOUTH 74°43'57" EAST 16.18 feet;
1337) SOUTH 85°21'36" EAST 78.82 feet;
1338) SOUTH 85°30'23" EAST 304.75 feet;
1339) NORTH 74°30'46" EAST 85.02 feet;
1340) NORTH 84°45'51" EAST 1359.45 feet;
1341) NORTH 84°45'19" EAST 3625.28 feet;
1342) NORTH 84°46'09" EAST 397.57 feet;
1343) NORTH 84°45'50" EAST 397.28 feet;
1344) NORTH 84°44'25" EAST 321.40 feet;
1345) NORTH 84°14'22" EAST 43.83 feet;
1346) NORTH 84°27'37" EAST 459.72 feet;
1347) NORTH 84°18'57" EAST 139.36 feet;
1348) SOUTH 89°05'00" EAST 174.13 feet;
1349) NORTH 76°49'50" EAST 149.61 feet;
1350) SOUTH 37°38'28" EAST 93.12 feet;
1351) SOUTH 68°10'48" EAST 301.04 feet;
1352) SOUTH 52°52'37" EAST 428.38 feet;
1353) SOUTH 42°29'18" EAST 564.30 feet;
1354) SOUTH 39°44'37" EAST 136.31 feet;
1355) SOUTH 68°42'02" EAST 1001.33 feet;
1356) SOUTH 68°43'13" EAST 2868.14 feet;
1357) SOUTH 68°30'37" EAST 48.68 feet;
1358) SOUTH 85°03'40" EAST 274.38 feet;
1359) SOUTH 85°29'15" EAST 173.62 feet;
1360) SOUTH 85°30'36" EAST 989.64 feet;
1361) NORTH 68°08'32" EAST 71.58 feet;
1362) NORTH 04°22'08" EAST 126.09 feet;
1363) SOUTH 84°14'53" EAST 100.03 feet;
1364) SOUTH 84°14'36" EAST 313.28 feet;
1365) NORTH 76°06'55" EAST 773.69 feet;
1366) NORTH 77°12'37" EAST 686.17 feet;
1367) NORTH 59°56'30" EAST 139.44 feet;
1368) NORTH 60°10'38" EAST 12.83 feet;
1369) NORTH 69°17'01" EAST 315.31 feet;
1370) NORTH 70°43'19" EAST 344.15 feet;
1371) NORTH 77°35'55" EAST 535.03 feet;
1372) NORTH 85°30'34" EAST 416.36 feet;
1373) NORTH 60°15'08" EAST 9.38 feet;
1374) NORTH 68°18'10" EAST 9.35 feet;
1375) NORTH 68°23'14" EAST 9.37 feet;
1376) NORTH 76°34'33" EAST 388.53 feet;

1377) NORTH 76°35'20" EAST 36.50 feet;
1378) SOUTH 87°57'05" EAST 209.56 feet;
1379) SOUTH 81°09'28" EAST 224.01 feet;
1380) NORTH 85°30'34" EAST 123.34 feet;
1381) SOUTH 75°32'38" EAST 15.52 feet;
1382) SOUTH 75°54'34" EAST 488.00 feet;
1383) SOUTH 70°22'31" EAST 531.73 feet;
1384) SOUTH 69°05'47" EAST 95.76 feet;
1385) SOUTH 69°12'32" EAST 62.04 feet;
1386) SOUTH 62°01'02" EAST 105.92 feet;
1387) SOUTH 72°50'15" EAST 59.21 feet;
1388) SOUTH 67°13'56" EAST 293.02 feet;
1389) NORTH 89°26'46" EAST 780.07 feet;
1390) SOUTH 03°28'03" EAST 167.41 feet;
1391) SOUTH 78°51'52" WEST 212.76 feet;
1392) SOUTH 84°55'32" EAST 134.82 feet;
1393) SOUTH 84°55'34" EAST 428.35 feet;
1394) NORTH 85°01'34" EAST 137.83 feet;
1395) NORTH 74°03'05" EAST 59.29 feet;
1396) NORTH 74°02'38" EAST 136.29 feet;
1397) NORTH 60°43'51" EAST 199.54 feet;
1398) NORTH 60°43'25" EAST 87.76 feet;
1399) NORTH 55°16'43" EAST 77.04 feet;
1400) NORTH 51°16'47" EAST 91.26 feet;
1401) NORTH 47°17'00" EAST 91.26 feet;
1402) NORTH 44°40'41" EAST 27.25 feet;
1403) NORTH 42°05'27" EAST 91.26 feet;
1404) NORTH 38°05'14" EAST 91.26 feet;
1405) NORTH 34°05'26" EAST 91.26 feet;
1406) NORTH 30°05'02" EAST 91.27 feet;
1407) NORTH 26°04'59" EAST 91.26 feet;
1408) NORTH 28°13'47" EAST 5.13 feet;
1409) NORTH 25°52'37" EAST 37.23 feet;
1410) NORTH 21°52'06" EAST 37.23 feet;
1411) NORTH 17°53'29" EAST 37.24 feet;
1412) NORTH 13°52'07" EAST 37.24 feet;
1413) NORTH 09°53'10" EAST 37.23 feet;
1414) NORTH 05°52'11" EAST 37.24 feet;
1415) NORTH 01°53'56" EAST 37.23 feet;
1416) NORTH 02°07'44" WEST 30.74 feet;
1417) NORTH 09°55'44" WEST 12.41 feet;
1418) NORTH 11°02'46" WEST 13.76 feet;
1419) NORTH 12°02'48" WEST 13.76 feet;
1420) NORTH 13°02'45" WEST 13.76 feet;
1421) NORTH 14°02'47" WEST 13.76 feet;
1422) NORTH 15°02'46" WEST 13.76 feet;
1423) NORTH 16°02'46" WEST 13.76 feet;
1424) NORTH 17°02'44" WEST 13.76 feet;
1425) NORTH 18°02'49" WEST 13.76 feet;
1426) NORTH 19°02'45" WEST 13.76 feet;
1427) NORTH 20°02'47" WEST 13.76 feet;

1428) NORTH 21°02'46” WEST 13.76 feet;
1429) NORTH 22°02'42” WEST 13.76 feet;
1430) NORTH 23°02'48” WEST 13.76 feet;
1431) NORTH 24°02'50” WEST 13.76 feet;
1432) NORTH 25°02'45” WEST 13.76 feet;
1433) NORTH 26°02'44” WEST 13.76 feet;
1434) NORTH 29°53'06” WEST 30.71 feet;
1435) NORTH 28°39'53” WEST 21.35 feet;
1436) NORTH 27°39'57” WEST 21.35 feet;
1437) NORTH 26°39'56” WEST 21.35 feet;
1438) NORTH 25°39'56” WEST 21.35 feet;
1439) NORTH 24°39'56” WEST 21.35 feet;
1440) NORTH 23°39'56” WEST 21.35 feet;
1441) NORTH 22°39'57” WEST 21.35 feet;
1442) NORTH 21°39'55” WEST 21.35 feet;
1443) NORTH 20°39'55” WEST 21.35 feet;
1444) NORTH 19°39'56” WEST 21.35 feet;
1445) NORTH 20°44'02” WEST 43.03 feet;
1446) NORTH 19°24'21” WEST 25.98 feet;
1447) NORTH 18°24'20” WEST 25.98 feet;
1448) NORTH 17°24'23” WEST 25.98 feet;
1449) NORTH 16°24'19” WEST 25.98 feet;
1450) NORTH 15°24'23” WEST 25.98 feet;
1451) NORTH 10°54'33” WEST 278.16 feet;
1452) NORTH 08°03'02” WEST 10.60 feet;
1453) NORTH 07°02'09” WEST 10.28 feet;
1454) NORTH 06°02'10” WEST 10.28 feet;
1455) NORTH 05°02'09” WEST 7.93 feet;
1456) NORTH 10°50'19” WEST 0.74 feet;
1457) NORTH 06°19'33” WEST 19.21 feet;
1458) NORTH 03°06'41” WEST 31.63 feet;
1459) NORTH 00°52'32” EAST 31.63 feet;
1460) NORTH 04°52'50” EAST 31.64 feet;
1461) NORTH 08°54'41” EAST 31.63 feet;
1462) NORTH 12°51'52” EAST 31.63 feet;
1463) NORTH 16°53'34” EAST 31.63 feet;
1464) NORTH 20°51'55” EAST 31.63 feet;
1465) NORTH 23°14'36” EAST 64.45 feet;
1466) NORTH 19°36'26” EAST 79.34 feet;
1467) NORTH 15°36'21” EAST 79.33 feet;
1468) NORTH 16°25'06” EAST 14.00 feet;
1469) NORTH 19°05'34” EAST 40.61 feet;
1470) NORTH 23°05'32” EAST 40.60 feet;
1471) NORTH 27°06'04” EAST 40.63 feet;
1472) NORTH 33°51'21” EAST 96.62 feet;
1473) NORTH 40°36'23” EAST 40.61 feet;
1474) NORTH 44°37'02” EAST 40.60 feet;
1475) NORTH 48°37'07” EAST 40.62 feet;
1476) NORTH 52°37'45” EAST 40.61 feet;
1477) NORTH 50°31'23” EAST 0.18 feet;
1478) NORTH 54°59'11” EAST 21.81 feet;

1479) NORTH 58°59'46" EAST 24.46 feet;
1480) NORTH 62°59'52" EAST 24.45 feet;
1481) NORTH 66°59'02" EAST 8.25 feet;
1482) NORTH 67°01'58" EAST 16.21 feet;
1483) NORTH 71°11'30" EAST 2.40 feet;
1484) NORTH 70°59'19" EAST 19.65 feet;
1485) NORTH 74°59'17" EAST 24.45 feet;
1486) NORTH 79°00'55" EAST 24.45 feet;
1487) NORTH 82°59'46" EAST 24.47 feet;
1488) NORTH 87°00'43" EAST 24.46 feet;
1489) SOUTH 89°00'15" EAST 24.45 feet;
1490) SOUTH 84°58'57" EAST 6.29 feet;
1491) SOUTH 84°58'21" EAST 18.16 feet;
1492) SOUTH 81°01'37" EAST 4.65 feet;
1493) SOUTH 80°58'12" EAST 19.80 feet;
1494) SOUTH 76°58'38" EAST 10.50 feet;
1495) SOUTH 77°01'35" EAST 13.96 feet;
1496) SOUTH 74°20'28" EAST 0.22 feet;
1497) SOUTH 72°59'30" EAST 23.93 feet;
1498) SOUTH 88°28'45" EAST 33.85 feet;
1499) SOUTH 47°51'58" EAST 46.64 feet;
1500) SOUTH 56°58'14" EAST 22.37 feet;
1501) SOUTH 52°59'37" EAST 24.45 feet;
1502) SOUTH 42°05'54" EAST 16.64 feet;
1503) SOUTH 39°06'59" EAST 26.64 feet;
1504) SOUTH 47°51'58" EAST 15.33 feet;
1505) SOUTH 30°30'59" EAST 154.85 feet;
1506) SOUTH 10°57'02" EAST 151.41 feet;
1507) SOUTH 01°31'43" WEST 180.61 feet;
1508) SOUTH 32°36'54" WEST 95.46 feet;
1509) SOUTH 01°30'44" WEST 397.26 feet;
1510) SOUTH 01°31'07" WEST 78.65 feet;
1511) SOUTH 16°53'30" EAST 103.62 feet;
1512) SOUTH 43°25'29" EAST 185.72 feet;
1513) SOUTH 65°10'33" EAST 97.80 feet;
1514) SOUTH 50°57'52" EAST 11.31 feet;
1515) SOUTH 75°38'29" EAST 15.73 feet;
1516) SOUTH 79°38'40" EAST 34.82 feet;
1517) SOUTH 83°39'19" EAST 34.84 feet;
1518) SOUTH 87°39'19" EAST 34.83 feet;
1519) NORTH 88°21'19" EAST 34.84 feet;
1520) NORTH 84°21'26" EAST 34.84 feet;
1521) NORTH 80°20'47" EAST 34.83 feet;
1522) NORTH 81°03'30" EAST 31.52 feet;
1523) NORTH 84°42'20" EAST 38.11 feet;
1524) NORTH 88°43'18" EAST 38.10 feet;
1525) SOUTH 87°17'33" EAST 38.11 feet;
1526) SOUTH 83°17'36" EAST 38.10 feet;
1527) SOUTH 79°17'14" EAST 38.11 feet;
1528) SOUTH 75°17'31" EAST 38.11 feet;
1529) SOUTH 71°17'30" EAST 38.11 feet;

1530) SOUTH 67°16'55" EAST 38.11 feet;
1531) SOUTH 63°17'42" EAST 38.11 feet;
1532) SOUTH 59°17'24" EAST 38.10 feet;
1533) SOUTH 55°17'17" EAST 38.11 feet;
1534) SOUTH 51°17'07" EAST 38.11 feet;
1535) SOUTH 47°17'11" EAST 38.11 feet;
1536) SOUTH 43°17'55" EAST 38.11 feet;
1537) SOUTH 39°16'34" EAST 38.11 feet;
1538) SOUTH 35°17'56" EAST 38.12 feet;
1539) SOUTH 31°17'03" EAST 38.10 feet;
1540) SOUTH 27°17'26" EAST 33.26 feet;
1541) SOUTH 27°18'50" EAST 4.85 feet;
1542) SOUTH 23°17'41" EAST 9.08 feet;
1543) SOUTH 23°17'16" EAST 14.92 feet;
1544) SOUTH 23°11'52" EAST 7.04 feet;
1545) SOUTH 22°02'37" EAST 2.18 feet;
1546) SOUTH 22°01'56" EAST 8.44 feet;
1547) SOUTH 19°16'11" EAST 16.34 feet;
1548) SOUTH 30°18'45" EAST 9.87 feet;
1549) SOUTH 07°58'44" EAST 10.17 feet;
1550) SOUTH 15°17'30" EAST 36.66 feet;
1551) SOUTH 11°16'57" EAST 27.64 feet;
1552) SOUTH 08°54'31" EAST 25.94 feet;
1553) SOUTH 03°17'57" EAST 23.55 feet;
1554) SOUTH 19°21'07" EAST 213.36 feet;
1555) SOUTH 19°19'00" EAST 131.13 feet;
1556) SOUTH 43°28'18" EAST 211.32 feet;
1557) SOUTH 43°25'06" EAST 113.45 feet;
1558) SOUTH 70°04'32" EAST 103.78 feet;
1559) NORTH 76°32'02" EAST 61.71 feet;
1560) NORTH 76°45'33" EAST 110.43 feet;
1561) NORTH 76°36'46" EAST 110.81 feet;
1562) NORTH 77°31'45" EAST 22.07 feet;
1563) NORTH 76°39'37" EAST 420.97 feet;
1564) NORTH 83°37'11" EAST 132.54 feet;
1565) SOUTH 62°17'43" EAST 209.78 feet;
1566) SOUTH 55°55'16" EAST 136.32 feet;
1567) SOUTH 04°48'41" EAST 32.20 feet;
1568) SOUTH 04°17'25" EAST 51.55 feet;
1569) SOUTH 04°10'58" EAST 32.90 feet;
1570) SOUTH 04°35'06" EAST 9.14 feet;
1571) SOUTH 22°36'33" WEST 209.31 feet;
1572) SOUTH 22°36'32" WEST 32.14 feet;
1573) SOUTH 22°22'19" WEST 32.48 feet;
1574) SOUTH 08°16'28" EAST 34.67 feet;
1575) SOUTH 05°16'10" EAST 94.85 feet;
1576) SOUTH 19°16'47" EAST 88.43 feet;
1577) SOUTH 40°43'03" EAST 85.69 feet;
1578) SOUTH 49°04'50" EAST 79.24 feet;
1579) SOUTH 67°39'54" EAST 165.70 feet;
1580) SOUTH 80°02'32" EAST 65.20 feet;

1581) SOUTH 87°34'44" EAST 11.02 feet;
1582) SOUTH 88°28'01" EAST 203.32 feet;
1583) SOUTH 88°55'33" EAST 195.49 feet;
1584) NORTH 79°12'00" EAST 57.17 feet;
1585) NORTH 54°20'17" WEST 84.52 feet;
1586) NORTH 54°14'57" WEST 57.31 feet;
1587) NORTH 54°07'01" WEST 57.76 feet;
1588) NORTH 54°17'27" WEST 45.26 feet;
1589) NORTH 83°33'26" WEST 90.11 feet;
1590) NORTH 70°17'22" EAST 219.51 feet;
1591) NORTH 87°48'30" EAST 170.04 feet;
1592) SOUTH 78°45'55" EAST 44.55 feet;
1593) SOUTH 78°59'05" EAST 136.51 feet;
1594) SOUTH 38°12'09" EAST 125.23 feet;
1595) SOUTH 00°52'34" WEST 84.11 feet;
1596) SOUTH 11°38'16" EAST 95.11 feet;
1597) SOUTH 21°13'46" WEST 218.64 feet;
1598) SOUTH 00°58'06" EAST 180.33 feet;
1599) SOUTH 24°59'02" WEST 107.30 feet;
1600) SOUTH 06°29'01" EAST 158.60 feet;
1601) SOUTH 07°53'16" EAST 78.10 feet;
1602) SOUTH 32°50'05" EAST 120.81 feet;
1603) SOUTH 03°35'09" EAST 190.28 feet;
1604) SOUTH 69°14'17" WEST 36.53 feet;
1605) SOUTH 69°52'09" WEST 198.06 feet;
1606) SOUTH 69°37'59" WEST 97.47 feet;
1607) SOUTH 69°46'17" WEST 97.07 feet;
1608) SOUTH 69°50'08" WEST 23.32 feet;
1609) SOUTH 69°34'38" WEST 23.05 feet;
1610) SOUTH 30°58'51" WEST 32.41 feet;
1611) SOUTH 13°06'37" WEST 224.66 feet;
1612) SOUTH 01°48'08" WEST 143.84 feet;
1613) SOUTH 02°36'09" WEST 144.62 feet;
1614) SOUTH 35°04'55" EAST 134.95 feet;
1615) NORTH 74°33'31" EAST 137.01 feet;
1616) NORTH 51°28'09" EAST 2.91 feet;
1617) NORTH 51°03'43" EAST 25.95 feet;
1618) NORTH 50°48'24" EAST 70.30 feet;
1619) NORTH 50°48'32" EAST 25.54 feet;
1620) NORTH 41°48'25" EAST 10.32 feet;
1621) NORTH 40°48'25" EAST 11.89 feet;
1622) NORTH 39°48'20" EAST 11.89 feet;
1623) NORTH 34°57'24" EAST 22.46 feet;
1624) NORTH 36°21'57" EAST 12.35 feet;
1625) NORTH 37°21'53" EAST 12.35 feet;
1626) NORTH 38°21'57" EAST 12.35 feet;
1627) NORTH 39°21'56" EAST 12.35 feet;
1628) NORTH 40°22'01" EAST 12.35 feet;
1629) NORTH 41°21'54" EAST 12.35 feet;
1630) NORTH 42°21'54" EAST 12.35 feet;
1631) NORTH 43°21'59" EAST 12.35 feet;

1632) NORTH 44°21'55" EAST 12.35 feet;
1633) NORTH 45°21'57" EAST 12.35 feet;
1634) NORTH 46°22'00" EAST 12.35 feet;
1635) NORTH 47°21'57" EAST 12.35 feet;
1636) NORTH 48°21'56" EAST 12.35 feet;
1637) NORTH 49°21'58" EAST 12.35 feet;
1638) NORTH 50°21'59" EAST 12.35 feet;
1639) NORTH 51°22'00" EAST 10.53 feet;
1640) NORTH 49°47'24" EAST 61.24 feet;
1641) NORTH 55°49'48" EAST 49.96 feet;
1642) NORTH 55°49'55" EAST 39.88 feet;
1643) NORTH 55°49'53" EAST 9.78 feet;
1644) NORTH 46°16'22" EAST 120.77 feet;
1645) NORTH 58°21'56" EAST 85.36 feet;
1646) NORTH 58°05'16" EAST 51.10 feet;
1647) NORTH 74°55'33" EAST 39.08 feet;
1648) NORTH 52°52'45" EAST 0.13 feet;
1649) NORTH 57°16'32" EAST 28.25 feet;
1650) NORTH 61°40'16" EAST 28.25 feet;
1651) NORTH 66°04'05" EAST 28.25 feet;
1652) NORTH 70°27'49" EAST 28.25 feet;
1653) NORTH 74°51'36" EAST 28.25 feet;
1654) NORTH 79°15'22" EAST 28.25 feet;
1655) NORTH 83°39'09" EAST 28.25 feet;
1656) NORTH 88°02'55" EAST 28.25 feet;
1657) SOUTH 82°38'34" EAST 22.51 feet;
1658) SOUTH 76°48'26" EAST 15.73 feet;
1659) NORTH 49°13'53" EAST 38.07 feet;
1660) NORTH 49°17'35" EAST 47.73 feet;
1661) NORTH 49°11'53" EAST 48.19 feet;
1662) NORTH 49°23'59" EAST 74.77 feet;
1663) NORTH 48°58'45" EAST 64.34 feet;
1664) SOUTH 61°14'36" EAST 48.27 feet;
1665) SOUTH 73°36'20" EAST 39.46 feet;
1666) SOUTH 63°52'51" EAST 45.25 feet;
1667) SOUTH 54°51'36" EAST 81.48 feet;
1668) SOUTH 42°01'47" EAST 98.92 feet;
1669) SOUTH 19°02'40" EAST 85.20 feet;
1670) SOUTH 11°04'25" EAST 60.29 feet;
1671) SOUTH 01°24'30" WEST 62.26 feet;
1672) SOUTH 11°04'42" WEST 34.41 feet;
1673) SOUTH 16°18'03" WEST 58.92 feet;
1674) SOUTH 23°24'10" WEST 48.48 feet;
1675) SOUTH 23°39'18" WEST 125.19 feet;
1676) SOUTH 23°38'10" WEST 52.52 feet;
1677) SOUTH 23°28'59" WEST 52.85 feet;
1678) SOUTH 23°49'40" WEST 25.31 feet;
1679) SOUTH 23°53'59" EAST 7.62 feet;
1680) SOUTH 22°18'11" EAST 14.19 feet;
1681) SOUTH 68°40'01" EAST 70.58 feet;
1682) SOUTH 67°55'53" EAST 129.58 feet;

1683) NORTH 57°37'30" EAST 51.96 feet;
1684) NORTH 64°52'08" EAST 11.63 feet;
1685) NORTH 64°43'48" EAST 22.31 feet;
1686) NORTH 63°24'49" EAST 22.90 feet;
1687) SOUTH 83°52'56" EAST 11.95 feet;
1688) SOUTH 85°42'31" EAST 30.53 feet;
1689) SOUTH 32°45'11" EAST 79.15 feet;
1690) SOUTH 32°20'38" EAST 12.19 feet;
1691) SOUTH 35°03'41" EAST 4.95 feet;
1692) SOUTH 35°25'50" EAST 69.13 feet;
1693) SOUTH 20°07'29" EAST 10.53 feet;
1694) SOUTH 19°12'39" EAST 1.15 feet;
1695) SOUTH 66°27'38" EAST 58.05 feet;
1696) SOUTH 65°43'30" EAST 147.16 feet;
1697) SOUTH 64°59'23" EAST 147.16 feet;
1698) NORTH 73°36'51" EAST 71.99 feet;
1699) NORTH 71°39'57" EAST 71.99 feet;
1700) NORTH 69°43'02" EAST 71.99 feet;
1701) NORTH 67°46'06" EAST 71.99 feet;
1702) NORTH 65°49'11" EAST 71.99 feet;
1703) NORTH 63°52'18" EAST 71.99 feet;
1704) NORTH 61°55'21" EAST 71.99 feet;
1705) NORTH 59°58'27" EAST 71.99 feet;
1706) NORTH 58°01'32" EAST 71.99 feet;
1707) NORTH 56°04'37" EAST 71.99 feet;
1708) NORTH 54°07'42" EAST 71.99 feet;
1709) NORTH 52°10'48" EAST 71.99 feet;
1710) NORTH 50°13'53" EAST 71.99 feet;
1711) SOUTH 05°32'35" EAST 38.32 feet;
1712) NORTH 57°03'01" EAST 64.58 feet;
1713) NORTH 56°48'20" EAST 430.98 feet;
1714) NORTH 56°47'56" EAST 720.79 feet to a point, having grid coordinates of N 1,992,155.85, E 6,149,802.67, said point being SOUTH 34°41'07" EAST 959.03 feet from NGS Monument "C 1371" (PID HS4395), being a 3.5-inch brass disc, punched and stamped "C 1371 1983", having grid coordinates of N 1,992,944.45, E 6,149,256.92;

1715) NORTH 57°38'24" EAST 31.23 feet;
1716) NORTH 56°51'52" EAST 551.45 feet;
1717) NORTH 57°36'48" EAST 30.54 feet;
1718) NORTH 59°23'21" EAST 57.18 feet;
1719) NORTH 58°54'38" EAST 252.47 feet;
1720) NORTH 60°28'36" EAST 186.41 feet;
1721) NORTH 61°32'38" EAST 156.13 feet;
1722) NORTH 57°18'35" EAST 157.43 feet;
1723) NORTH 60°39'36" EAST 163.56 feet;
1724) NORTH 58°46'06" EAST 169.25 feet;
1725) NORTH 58°18'21" EAST 152.90 feet;
1726) NORTH 56°16'42" EAST 99.42 feet;
1727) NORTH 60°12'52" EAST 177.12 feet;
1728) NORTH 59°27'38" EAST 216.62 feet;

1729) NORTH 60°32'14" EAST 379.30 feet;
1730) NORTH 24°26'54" WEST 302.08 feet;
1731) NORTH 67°38'45" EAST 685.31 feet;
1732) NORTH 57°59'22" EAST 11.40 feet;
1733) NORTH 84°36'26" EAST 60.15 feet;
1734) NORTH 84°15'26" EAST 56.97 feet;
1735) NORTH 85°00'54" EAST 42.89 feet;
1736) NORTH 67°40'47" EAST 144.29 feet;
1737) NORTH 70°54'10" EAST 11.73 feet;
1738) NORTH 63°33'22" EAST 158.74 feet;
1739) NORTH 76°34'24" EAST 39.83 feet;
1740) NORTH 63°12'19" EAST 25.89 feet;
1741) SOUTH 17°35'56" EAST 44.91 feet;
1742) SOUTH 17°33'46" EAST 25.71 feet;
1743) NORTH 70°14'15" EAST 6.20 feet;
1744) NORTH 68°46'15" EAST 21.30 feet;
1745) NORTH 68°41'58" EAST 48.26 feet;
1746) NORTH 07°01'49" WEST 16.91 feet;
1747) NORTH 07°31'03" WEST 33.86 feet;
1748) NORTH 06°26'53" WEST 31.94 feet;
1749) NORTH 64°05'42" EAST 31.53 feet;
1750) NORTH 57°36'19" EAST 61.08 feet;
1751) NORTH 75°01'33" EAST 34.69 feet;
1752) NORTH 74°03'25" EAST 16.37 feet;
1753) NORTH 74°54'21" EAST 88.75 feet;
1754) NORTH 71°38'56" EAST 5.53 feet;
1755) NORTH 72°01'21" EAST 108.25 feet;
1756) NORTH 64°40'01" EAST 155.90 feet;
1757) NORTH 64°20'08" EAST 90.50 feet;
1758) NORTH 79°34'25" EAST 13.02 feet;
1759) NORTH 77°23'46" EAST 39.09 feet;
1760) NORTH 77°43'22" EAST 12.82 feet;
1761) NORTH 75°04'26" EAST 21.41 feet;
1762) NORTH 74°13'45" EAST 63.61 feet;
1763) NORTH 73°54'55" EAST 21.24 feet;
1764) NORTH 73°20'18" EAST 45.96 feet;
1765) NORTH 72°54'10" EAST 36.61 feet;
1766) NORTH 71°20'17" EAST 14.16 feet;
1767) NORTH 76°46'28" EAST 4.49 feet;
1768) NORTH 73°03'59" EAST 13.11 feet;
1769) NORTH 73°48'16" EAST 69.52 feet;
1770) NORTH 73°13'42" EAST 45.68 feet;
1771) NORTH 73°58'07" EAST 47.62 feet;
1772) NORTH 73°32'04" EAST 56.24 feet;
1773) NORTH 78°00'36" EAST 72.04 feet;
1774) SOUTH 89°08'28" EAST 13.35 feet;
1775) SOUTH 89°08'27" EAST 46.44 feet;
1776) SOUTH 81°27'30" EAST 27.24 feet;
1777) SOUTH 81°34'01" EAST 63.53 feet;
1778) NORTH 88°30'14" EAST 17.72 feet;
1779) NORTH 86°57'29" EAST 26.76 feet;

1780) **NORTH 87°37'56" EAST 6.37 feet;**
1781) **NORTH 87°37'56" EAST 19.50 feet;**
1782) **NORTH 71°08'19" EAST 60.43 feet;**
1783) **NORTH 70°49'55" EAST 45.72 feet;**
1784) **NORTH 70°32'16" EAST 51.38 feet;**
1785) **NORTH 76°48'01" EAST 148.40 feet;**
1786) **NORTH 73°48'33" EAST 13.66 feet;**
1787) **NORTH 73°31'12" EAST 65.98 feet;**
1788) **NORTH 61°33'19" EAST 25.29 feet;**
1789) **NORTH 61°39'33" EAST 73.14 feet;**
1790) **NORTH 57°59'25" EAST 80.51 feet;**
1791) **NORTH 56°14'22" EAST 140.36 feet;**
1792) **NORTH 65°34'22" EAST 79.28 feet;**
1793) **NORTH 58°45'28" EAST 82.22 feet;**
1794) **NORTH 72°22'27" EAST 88.44 feet;**
1795) **NORTH 79°44'06" EAST 103.82 feet;**
1796) **NORTH 73°12'34" EAST 85.28 feet;**
1797) **NORTH 44°37'37" EAST 54.96 feet;**
1798) **NORTH 32°24'47" EAST 255.09 feet;**
1799) **NORTH 29°41'53" EAST 45.72 feet;**
1800) **NORTH 58°13'20" EAST 33.08 feet;**
1801) **NORTH 69°35'46" EAST 49.20 feet;**
1802) **NORTH 51°58'08" EAST 5.22 feet;**
1803) **NORTH 53°38'16" EAST 67.42 feet;**
1804) **NORTH 60°35'50" EAST 67.20 feet;**
1805) **NORTH 79°27'07" EAST 92.08 feet;**
1806) **NORTH 86°26'48" EAST 104.21 feet;**
1807) **NORTH 78°49'43" EAST 47.18 feet;**
1808) **NORTH 71°54'03" EAST 54.93 feet;**
1809) **NORTH 53°49'05" EAST 50.17 feet;**
1810) **NORTH 62°46'53" EAST 68.09 feet;**
1811) **NORTH 83°48'13" EAST 62.29 feet;**
1812) **NORTH 77°06'28" EAST 59.76 feet;**
1813) **NORTH 73°05'35" EAST 71.61 feet;**
1814) **NORTH 76°47'20" EAST 197.76 feet;**
1815) **NORTH 83°34'12" EAST 109.13 feet;**
1816) **NORTH 82°28'59" EAST 95.04 feet;**
1817) **NORTH 85°38'44" EAST 68.19 feet;**
1818) **NORTH 82°06'13" EAST 78.99 feet;**
1819) **NORTH 88°55'18" EAST 54.01 feet;**
1820) **SOUTH 87°01'20" EAST 108.04 feet;**
1821) **NORTH 87°59'25" EAST 80.20 feet;**
1822) **NORTH 80°50'25" EAST 138.22 feet;**
1823) **SOUTH 02°11'02" WEST 1324.21 feet;**
1824) **SOUTH 11°21'41" WEST 708.04 feet;**
1825) **SOUTH 07°38'58" EAST 606.11 feet to a point, having grid coordinates of N 1,993,168.29, E 6,157,448.50, said point being NORTH 25°42'27" EAST 9799.83 feet from NGS Monument "M 874" (PID HS2851), being a 3.5-inch brass disc, punched and stamped "M 874 1954", having grid coordinates of N 1,984,338.44, E 6,153,197.57;**

1826) SOUTH 34°24'19” EAST 1806.22 feet;
1827) SOUTH 42°39'37” EAST 543.89 feet;
1828) SOUTH 33°18'13” EAST 1705.18 feet;
1829) SOUTH 49°21'03” EAST 1944.17 feet;
1830) SOUTH 41°46'27” EAST 694.57 feet;
1831) SOUTH 34°04'20” EAST 924.32 feet;
1832) SOUTH 53°11'11” EAST 293.26 feet;
1833) SOUTH 33°49'08” WEST 174.40 feet;
1834) SOUTH 13°20'46” WEST 568.42 feet;
1835) SOUTH 13°12'08” EAST 707.53 feet;
1836) SOUTH 39°31'33” EAST 412.20 feet;
1837) SOUTH 73°27'14” EAST 465.18 feet;
1838) SOUTH 55°13'22” EAST 229.71 feet;
1839) SOUTH 30°49'23” EAST 260.15 feet;
1840) SOUTH 60°46'36” EAST 407.40 feet;
1841) SOUTH 21°09'44” EAST 661.00 feet;
1842) SOUTH 41°26'28” EAST 526.46 feet;
1843) SOUTH 66°09'26” EAST 819.49 feet to a point, having grid coordinates of N 1,983,394.22, E 6,165,120.04, said point being SOUTH 29°34'36" WEST 1567.91 feet from NGS Monument “COCHES” (PID HS4919), being a 3.5-inch aluminum disc, punched and stamped “COCHES 1958”, having grid coordinates of N 1,984,757.82, E 6,165,893.94;

1844) SOUTH 14°42'08” EAST 1746.47 feet;
1845) SOUTH 09°21'56” EAST 635.60 feet;
1846) SOUTH 31°23'16” EAST 201.35 feet;
1847) SOUTH 14°17'08” WEST 369.68 feet;
1848) SOUTH 13°32'01” EAST 1236.37 feet;
1849) SOUTH 47°39'35” EAST 454.39 feet;
1850) SOUTH 74°10'34” EAST 218.67 feet;
1851) SOUTH 09°48'42” EAST 103.19 feet;
1852) SOUTH 29°56'36” EAST 388.15 feet;
1853) SOUTH 57°57'12” EAST 1169.22 feet;
1854) SOUTH 89°50'21” EAST 259.01 feet;
1855) SOUTH 18°07'04” EAST 831.98 feet;
1856) SOUTH 39°49'50” EAST 485.50 feet;
1857) SOUTH 27°44'19” EAST 598.28 feet;
1858) SOUTH 10°49'39” EAST 587.82 feet;
1859) SOUTH 30°55'23” EAST 713.78 feet;
1860) SOUTH 40°10'36” EAST 594.17 feet;
1861) SOUTH 59°49'19” EAST 769.02 feet;
1862) SOUTH 44°22'37” EAST 392.87 feet;
1863) SOUTH 65°57'13” EAST 241.05 feet;
1864) SOUTH 25°05'28” WEST 157.86 feet;
1865) SOUTH 00°25'48” WEST 273.79 feet;
1866) SOUTH 27°26'41” EAST 407.68 feet;
1867) SOUTH 08°39'31” WEST 266.36 feet;
1868) SOUTH 15°17'26” EAST 249.68 feet;
1869) SOUTH 25°31'41” WEST 327.50 feet;
1870) SOUTH 01°08'15” WEST 727.70 feet;
1871) SOUTH 24°57'30” EAST 607.34 feet;

1872) SOUTH 43°52'03" EAST 674.59 feet;
1873) SOUTH 67°32'36" EAST 561.23 feet;
1874) SOUTH 17°05'06" EAST 322.43 feet;
1875) SOUTH 34°04'07" EAST 357.34 feet;
1876) SOUTH 61°24'28" EAST 925.82 feet;
1877) SOUTH 37°49'49" EAST 480.05 feet;
1878) SOUTH 73°00'53" EAST 714.96 feet;
1879) SOUTH 52°00'43" EAST 253.42 feet;
1880) SOUTH 78°31'20" EAST 292.88 feet;
1881) NORTH 70°01'05" EAST 715.21 feet;
1882) NORTH 26°21'44" EAST 311.75 feet;
1883) NORTH 56°34'23" EAST 382.32 feet;
1884) SOUTH 12°32'11" WEST 235.75 feet;
1885) SOUTH 11°38'59" EAST 412.99 feet;
1886) SOUTH 43°16'12" EAST 352.76 feet;
1887) SOUTH 20°10'16" EAST 608.01 feet;
1888) SOUTH 34°01'24" EAST 474.47 feet;
1889) SOUTH 53°29'16" EAST 555.48 feet;
1890) SOUTH 40°37'25" EAST 903.90 feet;
1891) SOUTH 64°03'03" EAST 823.86 feet to a point, having grid coordinates of N 1,965,913.64, E 6,178,304.58, said point being SOUTH 22°17'11" WEST 2142.70 feet from NGS Monument "CROTHERS" (PID DG6884), being a 2-inch brass disc, punched and stamped "COUNTY OF SANTA CLARA COMM", having grid coordinates of N 1,967,896.29, E 6,179,117.18;

1892) SOUTH 07°15'08" EAST 1851.78 feet;
1893) SOUTH 05°57'11" WEST 1016.39 feet;
1894) SOUTH 27°48'36" WEST 362.71 feet;
1895) SOUTH 14°30'18" EAST 408.05 feet;
1896) SOUTH 00°36'03" EAST 417.35 feet;
1897) SOUTH 21°31'36" EAST 511.76 feet;
1898) SOUTH 43°18'04" EAST 243.41 feet;
1899) SOUTH 65°04'32" EAST 810.36 feet;
1900) SOUTH 18°17'27" EAST 1451.69 feet;
1901) SOUTH 24°09'01" WEST 290.17 feet;
1902) SOUTH 05°19'06" WEST 539.35 feet;
1903) SOUTH 07°12'36" EAST 1908.57 feet;
1904) SOUTH 17°51'47" EAST 365.66 feet;
1905) SOUTH 36°16'12" EAST 1088.43 feet;
1906) SOUTH 53°06'08" EAST 1576.16 feet;
1907) SOUTH 74°39'09" EAST 3203.25 feet;
1908) SOUTH 88°17'42" EAST 784.09 feet;
1909) NORTH 72°23'40" EAST 381.18 feet;
1910) SOUTH 47°48'33" EAST 213.82 feet;
1911) SOUTH 24°54'24" WEST 801.93 feet;
1912) SOUTH 02°58'43" EAST 545.70 feet;
1913) SOUTH 46°25'35" EAST 579.19 feet;
1914) SOUTH 31°45'05" EAST 362.93 feet;
1915) SOUTH 8°35'04" WEST 120.99 feet;
1916) SOUTH 44°51'32" WEST 470.72 feet;
1917) SOUTH 01°36'15" EAST 558.19 feet;

1918) SOUTH 35°28'55" WEST 739.84 feet;
1919) SOUTH 06°41'40" WEST 450.85 feet;
1920) SOUTH 62°15'24" WEST 556.38 feet;
1921) SOUTH 24°57'56" WEST 329.27 feet;
1922) SOUTH 01°33'31" EAST 400.61 feet;
1923) SOUTH 23°16'01" EAST 990.73 feet;
1924) SOUTH 23°16'01" EAST 81.58 feet;
1925) NORTH 75°41'26" EAST 1045.88 feet;
1926) SOUTH 67°34'17" WEST 394.86 feet;
1927) SOUTH 54°04'10" EAST 735.22 feet;
1928) SOUTH 19°02'02" WEST 335.38 feet;
1929) SOUTH 31°16'51" EAST 636.69 feet;
1930) SOUTH 54°36'22" EAST 485.25 feet;
1931) SOUTH 79°44'38" EAST 587.66 feet;
1932) NORTH 48°11'10" EAST 246.23 feet;
1933) NORTH 08°58'23" EAST 342.87 feet;
1934) NORTH 20°14'45" WEST 439.60 feet;
1935) NORTH 63°07'27" EAST 253.16 feet;
1936) NORTH 38°17'48" EAST 286.06 feet;
1937) NORTH 88°41'48" EAST 248.48 feet;
1938) SOUTH 21°48'21" EAST 423.16 feet;
1939) SOUTH 52°52'01" EAST 653.33 feet;
1940) NORTH 88°33'53" EAST 532.72 feet;
1941) SOUTH 59°26'40" EAST 560.52 feet;
1942) NORTH 87°34'47" EAST 543.52 feet;
1943) NORTH 36°48'24" EAST 328.85 feet;
1944) SOUTH 47°25'04" EAST 680.88 feet;
1945) SOUTH 52°44'01" EAST 430.01 feet;
1946) SOUTH 75°56'55" EAST 174.85 feet;
1947) SOUTH 75°56'44" EAST 218.46 feet;
1948) NORTH 78°40'09" EAST 352.74 feet;
1949) SOUTH 62°06'13" EAST 580.36 feet;
1950) SOUTH 04°53'32" WEST 512.42 feet;
1951) SOUTH 14°54'00" EAST 222.18 feet;
1952) SOUTH 34°41'31" EAST 255.21 feet;
1953) SOUTH 34°41'31" EAST 133.88 feet;
1954) SOUTH 05°43'21" EAST 204.69 feet;
1955) SOUTH 23°53'21" EAST 204.58 feet;
1956) SOUTH 42°03'21" EAST 275.57 feet;
1957) SOUTH 06°05'40" EAST 257.07 feet;
1958) SOUTH 36°43'28" EAST 253.31 feet;
1959) SOUTH 32°53'55" WEST 454.48 feet;
1960) SOUTH 14°25'26" EAST 501.54 feet;
1961) SOUTH 39°14'45" EAST 425.35 feet;
1962) SOUTH 71°21'02" EAST 344.95 feet;
1963) NORTH 84°18'10" EAST 348.99 feet;
1964) SOUTH 24°24'09" EAST 1029.64 feet to a point, having grid coordinates of N 1,941,396.95, E 6,195,325.82, said point being NORTH 16°03'59" WEST 358.09 feet from NGS Monument "T 1474" (PID AI8041), being a steel rod inside a monument well, rim encasement stamped "T 1474 2000", having grid coordinates of N 1,941,052.84, E 6,195,424.92;

1965) SOUTH 80°14'25” WEST 373.13 feet;
1966) SOUTH 23°58'32” WEST 325.00 feet;
1967) SOUTH 29°45'59” EAST 552.23 feet;
1968) SOUTH 60°28'52” EAST 717.73 feet;
1969) NORTH 83°28'02” EAST 353.15 feet;
1970) SOUTH 24°46'39” EAST 54.80 feet;
1971) NORTH 70°41'41” EAST 141.92 feet;
1972) SOUTH 17°10'44” EAST 260.08 feet;
1973) SOUTH 30°09'21” EAST 147.66 feet;
1974) SOUTH 51°23'29” EAST 1076.97 feet;
1975) SOUTH 66°25'45” EAST 343.18 feet;
1976) SOUTH 86°24'00” EAST 298.38 feet;
1977) SOUTH 51°07'55” EAST 136.75 feet;
1978) SOUTH 17°39'24” WEST 99.56 feet;
1979) SOUTH 01°32'40” WEST 268.18 feet;
1980) SOUTH 17°32'22” EAST 566.23 feet;
1981) SOUTH 07°23'34” EAST 476.33 feet;
1982) SOUTH 26°56'58” EAST 176.45 feet;
1983) SOUTH 51°02'20” EAST 503.76 feet;
1984) SOUTH 70°05'33” EAST 524.34 feet;
1985) SOUTH 28°38'51” EAST 234.79 feet;
1986) SOUTH 06°46'32” EAST 243.31 feet;
1987) SOUTH 36°09'37” EAST 274.41 feet;
1988) SOUTH 27°02'54” WEST 307.15 feet;
1989) SOUTH 02°18'45” EAST 262.34 feet;
1990) SOUTH 41°57'29” EAST 475.04 feet;
1991) SOUTH 37°35'42” WEST 244.61 feet;
1992) NORTH 83°32'07” WEST 498.81 feet;
1993) SOUTH 73°30'30” WEST 931.65 feet;
1994) SOUTH 62°51'16” WEST 849.07 feet;
1995) SOUTH 84°22'08” WEST 375.57 feet;
1996) NORTH 64°56'07” EAST 261.97 feet;
1997) NORTH 39°20'17” EAST 186.16 feet;
1998) NORTH 22°51'24” EAST 368.14 feet;
1999) NORTH 09°32'20” EAST 151.15 feet;
2000) NORTH 19°33'47” WEST 178.49 feet;
2001) NORTH 42°49'10” WEST 363.48 feet;
2002) NORTH 66°29'06” WEST 301.97 feet;
2003) NORTH 51°54'04” WEST 493.58 feet;
2004) NORTH 77°28'32” WEST 283.26 feet;
2005) SOUTH 76°57'00” WEST 272.69 feet;
2006) NORTH 49°08'19” WEST 209.01 feet;
2007) NORTH 75°20'10” WEST 300.66 feet;
2008) SOUTH 64°13'36” WEST 333.89 feet;
2009) SOUTH 38°52'54” WEST 287.80 feet;
2010) NORTH 85°07'21” WEST 231.59 feet;
2011) SOUTH 75°09'34” WEST 1010.45 feet;
2012) SOUTH 53°39'03” WEST 227.42 feet;
2013) SOUTH 13°46'44” WEST 220.03 feet;
2014) SOUTH 30°49'50” EAST 277.48 feet;

2015) SOUTH 55°50'50” EAST 2851.23 feet;
2016) SOUTH 51°34'28” EAST 1224.88 feet;
2017) SOUTH 67°48'40” EAST 184.77 feet;
2018) SOUTH 84°09'57” EAST 580.04 feet;
2019) SOUTH 71°59'11” EAST 436.37 feet;
2020) NORTH 73°53'49” EAST 216.45 feet;
2021) SOUTH 21°50'30” EAST 311.87 feet;
2022) SOUTH 67°44'09” EAST 836.04 feet;
2023) SOUTH 74°01'50” EAST 1073.14 feet;
2024) NORTH 88°36'48” EAST 569.94 feet;
2025) NORTH 65°56'26” EAST 319.04 feet;
2026) SOUTH 82°41'30” EAST 186.64 feet;
2027) NORTH 80°45'57” EAST 172.19 feet;
2028) SOUTH 69°30'01” EAST 413.47 feet;
2029) SOUTH 45°32'10” EAST 385.57 feet;
2030) SOUTH 02°17'03” EAST 170.16 feet;
2031) SOUTH 31°09'11” WEST 366.59 feet;
2032) SOUTH 00°07'06” EAST 376.32 feet;
2033) SOUTH 31°33'51” EAST 277.21 feet;
2034) SOUTH 64°47'45” WEST 214.46 feet;
2035) SOUTH 87°54'53” WEST 384.91 feet;
2036) SOUTH 51°06'08” WEST 264.15 feet;
2037) SOUTH 06°51'32” WEST 229.84 feet;
2038) SOUTH 26°53'51” EAST 405.70 feet;
2039) SOUTH 29°29'06” EAST 50.42 feet;
2040) SOUTH 24°30'19” EAST 54.53 feet;
2041) SOUTH 26°53'51” EAST 70.66 feet;
2042) SOUTH 14°33'50” EAST 161.44 feet;
2043) SOUTH 05°28'12” EAST 41.71 feet;
2044) SOUTH 32°06'34” WEST 185.67 feet;
2045) SOUTH 52°42'07” WEST 46.48 feet;
2046) SOUTH 51°43'05” WEST 35.90 feet;
2047) SOUTH 52°53'42” WEST 72.37 feet;
2048) SOUTH 52°58'32” WEST 77.93 feet;
2049) SOUTH 20°42'49” WEST 249.91 feet;
2050) SOUTH 23°52'45” WEST 14.67 feet;
2051) SOUTH 20°53'21” WEST 68.22 feet;
2052) SOUTH 16°55'35” WEST 45.52 feet;
2053) SOUTH 22°10'02” WEST 141.05 feet;
2054) SOUTH 20°53'21” WEST 415.26 feet;
2055) SOUTH 03°01'04” EAST 991.87 feet;
2056) SOUTH 31°49'54” EAST 856.27 feet;
2057) SOUTH 12°16'11” EAST 453.92 feet;
2058) SOUTH 17°14'17” WEST 352.95 feet;
2059) SOUTH 49°05'36” WEST 1311.61 feet;
2060) SOUTH 28°44'34” WEST 227.90 feet to a point, having grid coordinates of N 1,924,384.87, E 6,200,432.14, said point being NORTH 30°49'13" EAST 15839.77 feet from said SCVWD Benchmark “BM561”, having grid coordinates of N 1,910,782.03, E 6,192,316.66;

2061) NORTH 81°46'39” WEST 290.16 feet;

2062) NORTH 52°54'34" WEST 368.40 feet;
2063) NORTH 81°09'04" WEST 477.62 feet;
2064) NORTH 24°14'23" WEST 502.63 feet;
2065) NORTH 51°47'02" EAST 461.31 feet;
2066) NORTH 02°57'11" EAST 328.70 feet;
2067) NORTH 53°33'19" WEST 421.32 feet;
2068) NORTH 35°20'51" WEST 637.17 feet;
2069) NORTH 57°33'56" WEST 662.43 feet;
2070) NORTH 19°01'41" WEST 355.29 feet;
2071) NORTH 44°48'23" WEST 453.82 feet;
2072) NORTH 28°43'07" WEST 1032.39 feet;
2073) NORTH 45°09'26" WEST 905.93 feet;
2074) NORTH 36°56'49" WEST 1167.40 feet;
2075) NORTH 50°28'15" WEST 2680.72 feet;
2076) NORTH 64°16'52" WEST 1379.58 feet;
2077) NORTH 86°51'29" WEST 536.84 feet;
2078) SOUTH 49°46'31" WEST 352.46 feet;
2079) NORTH 58°29'31" WEST 74.44 feet;
2080) NORTH 20°47'41" WEST 810.20 feet;
2081) NORTH 50°17'34" WEST 3907.27 feet;
2082) SOUTH 84°22'25" WEST 227.78 feet;
2083) NORTH 37°30'00" WEST 468.43 feet;
2084) NORTH 61°50'57" WEST 1650.17 feet;
2085) SOUTH 74°52'59" WEST 280.17 feet;
2086) NORTH 62°35'19" WEST 605.52 feet;
2087) NORTH 84°34'55" WEST 509.52 feet;
2088) NORTH 37°12'29" WEST 867.14 feet;
2089) NORTH 55°24'20" WEST 209.91 feet;
2090) SOUTH 85°17'57" WEST 543.54 feet;
2091) NORTH 62°05'32" WEST 355.41 feet;
2092) SOUTH 78°08'02" WEST 330.29 feet;
2093) SOUTH 44°38'50" WEST 370.58 feet;
2094) SOUTH 02°08'52" WEST 608.05 feet;
2095) SOUTH 24°38'34" EAST 474.37 feet;
2096) SOUTH 16°45'21" WEST 706.33 feet;
2097) SOUTH 13°49'02" EAST 583.79 feet;
2098) SOUTH 40°47'08" EAST 353.37 feet;
2099) SOUTH 62°17'14" EAST 847.58 feet;
2100) SOUTH 46°15'39" EAST 1606.31 feet;
2101) NORTH 65°57'55" WEST 466.97 feet;
2102) NORTH 87°03'47" WEST 559.63 feet;
2103) NORTH 65°04'35" WEST 647.17 feet;
2104) SOUTH 71°25'16" WEST 1339.80 feet;
2105) SOUTH 33°39'31" WEST 627.34 feet;
2106) NORTH 74°42'48" WEST 195.94 feet;
2107) NORTH 89°21'16" WEST 1107.69 feet to a point, having grid coordinates of N 1,932,987.63, E 6,180,884.34, said point being NORTH 14°48'54" EAST 375.38 feet from SCVWD Benchmark “BM376”, being a 2-inch brass disc, punched and stamped “BM 376”, having grid coordinates of 1,932,624.74, E 6;180,788.35;

2108) NORTH 66°06'13” WEST 862.17 feet;
2109) SOUTH 88°13'24” WEST 205.66 feet;
2110) SOUTH 49°51'18” WEST 522.04 feet;
2111) SOUTH 03°17'58” WEST 272.61 feet;
2112) SOUTH 37°10'19” EAST 1407.29 feet;
2113) SOUTH 40°21'42” WEST 243.53 feet;
2114) SOUTH 12°23'03” WEST 367.36 feet;
2115) SOUTH 09°30'02” EAST 155.52 feet;
2116) SOUTH 31°44'34” EAST 967.13 feet;
2117) SOUTH 02°25'05” WEST 667.43 feet;
2118) NORTH 67°04'25” WEST 400.79 feet;
2119) SOUTH 76°36'34” WEST 231.37 feet;
2120) SOUTH 49°46'42” WEST 231.86 feet;
2121) SOUTH 09°49'39” WEST 328.12 feet;
2122) SOUTH 12°24'15” EAST 193.17 feet;
2123) SOUTH 45°35'30” EAST 543.07 feet;
2124) SOUTH 34°05'43” EAST 1173.84 feet;
2125) SOUTH 65°05'16” EAST 903.54 feet;
2126) SOUTH 28°57'37” EAST 344.41 feet;
2127) SOUTH 40°16'15” EAST 897.41 feet;
2128) SOUTH 65°34'29” EAST 459.88 feet;
2129) SOUTH 38°07'00” EAST 275.45 feet;
2130) SOUTH 87°47'08” WEST 314.39 feet;
2131) SOUTH 68°49'09” WEST 384.92 feet;
2132) NORTH 26°46'05” WEST 777.38 feet;
2133) NORTH 56°07'49” WEST 563.56 feet;
2134) SOUTH 87°52'02” WEST 501.49 feet;
2135) SOUTH 70°44'50” WEST 449.64 feet;
2136) NORTH 85°55'11” WEST 264.51 feet;
2137) SOUTH 52°12'28” WEST 771.59 feet;
2138) SOUTH 83°09'43” WEST 276.10 feet;
2139) NORTH 63°09'43” WEST 277.10 feet;
2140) NORTH 83°19'32” WEST 365.53 feet;
2141) SOUTH 76°58'51” WEST 221.12 feet;
2142) SOUTH 57°17'15” WEST 288.08 feet;
2143) NORTH 69°11'50” WEST 199.84 feet;
2144) NORTH 76°07'54” WEST 626.45 feet;
2145) SOUTH 87°07'46” WEST 230.36 feet;
2146) NORTH 36°18'20” WEST 264.91 feet;
2147) NORTH 54°25'40” WEST 262.97 feet;
2148) NORTH 64°34'50” WEST 595.77 feet;
2149) SOUTH 71°27'40” WEST 222.91 feet;
2150) SOUTH 55°39'01” WEST 431.85 feet;
2151) NORTH 77°52'49” WEST 1766.13 feet;
2152) SOUTH 76°34'37” WEST 282.93 feet;
2153) SOUTH 25°44'47” WEST 447.92 feet;
2154) SOUTH 12°43'22” EAST 219.98 feet;
2155) SOUTH 46°29'27” EAST 365.86 feet;
2156) SOUTH 26°13'22” EAST 66.91 feet;
2157) SOUTH 13°15'35” WEST 422.71 feet;
2158) SOUTH 02°58'58” EAST 183.53 feet;

2159) SOUTH 25°33'03" EAST 322.39 feet;
2160) SOUTH 65°52'35" EAST 221.66 feet;
2161) NORTH 76°44'44" EAST 378.67 feet;
2162) NORTH 47°30'05" EAST 286.74 feet;
2163) SOUTH 50°22'24" EAST 316.62 feet;
2164) SOUTH 86°01'55" EAST 425.63 feet;
2165) SOUTH 54°42'27" EAST 211.13 feet;
2166) SOUTH 22°20'45" WEST 144.31 feet;
2167) SOUTH 07°51'21" EAST 197.28 feet;
2168) SOUTH 42°17'38" EAST 527.08 feet;
2169) SOUTH 71°23'07" EAST 299.70 feet;
2170) NORTH 77°57'19" EAST 277.69 feet;
2171) NORTH 47°20'51" EAST 176.59 feet;
2172) SOUTH 73°23'31" EAST 420.81 feet;
2173) SOUTH 67°48'23" EAST 419.65 feet;
2174) SOUTH 80°15'37" EAST 779.03 feet;
2175) SOUTH 00°03'07" EAST 206.05 feet;
2176) SOUTH 33°25'21" EAST 203.28 feet;
2177) SOUTH 70°13'28" EAST 841.36 feet;
2178) SOUTH 81°50'59" EAST 1075.97 feet;
2179) NORTH 65°17'09" EAST 308.06 feet;
2180) NORTH 88°18'53" EAST 492.75 feet;
2181) NORTH 51°01'42" EAST 370.15 feet;
2182) NORTH 77°22'40" EAST 347.12 feet;
2183) NORTH 38°32'38" EAST 245.54 feet;
2184) NORTH 09°47'42" EAST 250.69 feet;
2185) NORTH 89°30'17" EAST 215.31 feet;
2186) SOUTH 62°33'46" EAST 451.54 feet;
2187) SOUTH 77°54'35" EAST 173.66 feet;
2188) NORTH 72°29'53" EAST 273.58 feet;
2189) SOUTH 72°58'51" EAST 510.68 feet;
2190) SOUTH 59°25'57" EAST 405.18 feet;
2191) NORTH 70°56'14" EAST 425.81 feet;
2192) NORTH 26°02'25" EAST 269.26 feet;
2193) NORTH 24°06'30" WEST 560.34 feet;
2194) NORTH 08°15'41" EAST 461.86 feet;
2195) NORTH 19°49'17" WEST 492.09 feet;
2196) SOUTH 71°20'25" EAST 1165.11 feet;
2197) SOUTH 44°08'04" EAST 1565.04 feet;
2198) SOUTH 56°54'12" EAST 145.03 feet;
2199) SOUTH 82°59'46" EAST 151.22 feet;
2200) SOUTH 32°55'32" EAST 220.84 feet;
2201) NORTH 62°26'55" WEST 512.97 feet;
2202) NORTH 83°47'15" WEST 1203.22 feet;
2203) SOUTH 66°56'23" WEST 475.12 feet;
2204) SOUTH 35°54'57" WEST 262.86 feet;
2205) SOUTH 09°13'41" EAST 455.07 feet;
2206) SOUTH 40°31'15" EAST 300.34 feet;
2207) SOUTH 87°29'59" EAST 403.74 feet;
2208) SOUTH 68°59'43" EAST 211.04 feet;
2209) SOUTH 47°17'14" EAST 898.25 feet;

2210) NORTH 87°15'33" EAST 340.37 feet to a point, having grid coordinates of N 1,921,890.20, E 6,186,120.49, said point being NORTH 50°21'35" EAST 5334.57 feet from said NGS Monument "QQ 453" (PID HS2787), having grid coordinates of N 1,918,486.92, E 6,182,012.53;

2211) SOUTH 16°57'59" EAST 592.56 feet;
2212) SOUTH 49°33'23" EAST 573.01 feet;
2213) SOUTH 63°04'39" EAST 2405.15 feet;
2214) SOUTH 41°36'51" EAST 1268.87 feet;
2215) SOUTH 42°50'03" EAST 611.07 feet;
2216) SOUTH 72°50'39" EAST 648.88 feet;
2217) SOUTH 51°16'00" EAST 1076.53 feet;
2218) SOUTH 28°59'05" WEST 161.00 feet;
2219) SOUTH 69°31'25" WEST 310.30 feet;
2220) NORTH 47°08'29" WEST 682.26 feet;
2221) NORTH 79°25'05" WEST 223.74 feet;
2222) SOUTH 57°57'36" WEST 525.84 feet;
2223) SOUTH 11°58'17" WEST 283.58 feet;
2224) SOUTH 33°02'57" EAST 392.96 feet;
2225) SOUTH 00°18'34" WEST 285.17 feet;
2226) SOUTH 39°52'06" EAST 785.03 feet;
2227) SOUTH 55°39'55" EAST 921.51 feet;
2228) SOUTH 72°39'36" EAST 185.98 feet;
2229) SOUTH 24°04'42" EAST 184.01 feet;
2230) SOUTH 40°23'21" EAST 1069.62 feet;
2231) SOUTH 26°41'33" EAST 398.71 feet;
2232) SOUTH 12°46'40" EAST 902.07 feet;
2233) SOUTH 34°13'09" EAST 1393.26 feet to a point, having grid coordinates of N 1,912,137.38, E 6,193,583.29, said point being NORTH 43°03'43" EAST 1855.08 feet from said SCVWD Benchmark "BM561", having grid coordinates of N 1,910,782.03, E 6,192,316.66;

2234) SOUTH 63°10'49" EAST 542.72 feet;
2235) SOUTH 47°43'15" EAST 614.40 feet;
2236) SOUTH 79°45'33" EAST 261.04 feet;
2237) SOUTH 09°25'48" EAST 101.34 feet;
2238) SOUTH 35°36'54" EAST 195.13 feet;
2239) SOUTH 52°54'56" EAST 804.41 feet;
2240) SOUTH 43°12'45" EAST 258.48 feet;
2241) SOUTH 24°36'06" EAST 522.87 feet;
2242) SOUTH 54°36'48" EAST 600.23 feet;
2243) SOUTH 45°44'01" EAST 546.84 feet;
2244) SOUTH 70°57'32" EAST 515.56 feet;
2245) SOUTH 60°37'18" EAST 723.14 feet;
2246) NORTH 83°06'12" EAST 453.94 feet;
2247) SOUTH 05°19'40" EAST 149.33 feet;
2248) SOUTH 27°38'02" EAST 418.98 feet;
2249) NORTH 47°45'51" EAST 0.92 feet;
2250) SOUTH 44°19'07" EAST 77.07 feet;
2251) SOUTH 54°53'58" WEST 1256.28 feet to the **POINT OF BEGINNING.**

EXCEPTING THEREFROM the following nine (9) Parcels:

PARCEL 1:

COMMENCING at NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of **N 1,972,516.68, E 6,115,439.35**, said brass disc being **NORTH 50°56'16" WEST 85,739.10** feet from NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of **N 1,918,486.92, E 6,182,012.53**;

Thence from said **POINT OF COMMENCEMENT, SOUTH 12°12'07" WEST 31,835.02** feet to a point with grid coordinates of **N 1,941,400.85, E 6,108,710.80**, said point being the **TRUE POINT OF BEGINNING** ;

Thence in a clockwise direction, the following eleven (11) courses:

1. **SOUTH 32°10'17" EAST 434.00 feet;**
2. **SOUTH 09°33'16" WEST 837.45 feet;**
3. **SOUTH 29°34'42" WEST 901.45 feet;**
4. **SOUTH 47°04'35" WEST 544.93 feet;**
5. **NORTH 88°39'36" WEST 300.80 feet;**
6. **NORTH 42°35'29" WEST 521.60 feet;**
7. **NORTH 10°47'06" WEST 671.89** feet to a point, having grid coordinates of **N 1,940,103.64, E 6,107,179.43**, said point being **SOUTH 39°53'50" EAST 9023.40** feet from the abovementioned NGS Monument "HPGN D CA SAN ANTONIO" (PID AA1871), having grid coordinates of **N 1,947,026.36, E 6,101,391.70**;

8. **NORTH 24°21'18" EAST 413.93 feet;**
9. **NORTH 53°57'26" EAST 683.42 feet;**
10. **NORTH 39°12'53" EAST 486.64 feet;**
11. **NORTH 74°16'03" EAST 519.88** to the **POINT OF BEGINNING.**

PARCEL 2:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of **N 1,918,486.92, E 6,182,012.53**, said brass disc being **SOUTH 50°56'16" EAST 85,739.16** feet from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of **N 1,972,516.68, E 6,115,439.35**;

Thence from said **POINT OF COMMENCEMENT, NORTH 48°30'40" WEST 15,150.74** feet to a point with grid coordinates of **N 1,928,523.92, E 6,170,663.36**, said point being the **TRUE POINT OF BEGINNING** ;

Thence in a clockwise direction, the following eighty-nine (89) courses:

1. SOUTH 39°07'11" WEST 607.39 feet;
2. SOUTH 77°37'38" WEST 503.52 feet;
3. SOUTH 04°32'22" WEST 343.89 feet;
4. SOUTH 51°17'59" WEST 480.03 feet;
5. SOUTH 16°34'59" EAST 343.18 feet;
6. SOUTH 16°42'29" WEST 390.77 feet;
7. SOUTH 53°15'31" WEST 584.97 feet;
8. SOUTH 21°36'13" WEST 695.37 feet;
9. SOUTH 56°53'31" WEST 456.07 feet;
10. SOUTH 86°52'47" WEST 1078.26 feet;
11. SOUTH 70°16'07" WEST 638.00 feet;
12. NORTH 81°14'53" WEST 558.42 feet;
13. NORTH 23°10'05" WEST 555.35 feet;
14. NORTH 15°34'17" EAST 488.45 feet;
15. NORTH 37°06'15" EAST 593.67 feet;
16. NORTH 26°24'19" EAST 630.03 feet;
17. NORTH 56°30'57" EAST 291.73 feet;
18. NORTH 65°39'15" WEST 533.83 feet;
19. SOUTH 79°07'55" WEST 372.60 feet;
20. NORTH 68°21'59" WEST 727.77 feet;
21. NORTH 43°23'55" WEST 276.97 feet;
22. NORTH 11°12'14" WEST 289.30 feet;
23. NORTH 85°53'09" WEST 437.96 feet;
24. NORTH 60°14'08" WEST 258.91 feet;
25. NORTH 53°47'57" WEST 428.70 feet;
26. SOUTH 33°01'29" EAST 411.27 feet to a point, having grid coordinates of N 1,928,660.11, E 6,164,047.58, said point being SOUTH 10°18'00" WEST 1482.82 feet from NGS Monument "AMERICAN RESET" (PID HS4931), being a 2-inch brass disc, punched and stamped "American 1947 1973" having grid coordinates of N 1,930,119.03, E 6,164,312.71;

27. SOUTH 07°20'08" EAST 465.59 feet;
28. SOUTH 37°30'20" WEST 567.17 feet;
29. SOUTH 74°42'03" WEST 949.85 feet;
30. NORTH 63°40'43" WEST 513.73 feet;
31. NORTH 60°23'58" WEST 798.50 feet;
32. NORTH 18°34'36" WEST 651.41 feet;
33. NORTH 00°52'18" EAST 838.89 feet;
34. NORTH 48°39'25" WEST 886.58 feet;
35. NORTH 26°02'22" WEST 329.26 feet;
36. NORTH 20°05'27" EAST 482.91 feet;
37. NORTH 22°59'23" WEST 489.03 feet;
38. NORTH 21°48'06" EAST 462.29 feet;
39. NORTH 84°15'30" EAST 443.51 feet;
40. SOUTH 57°37'16" EAST 367.60 feet;
41. SOUTH 36°22'52" EAST 738.18 feet;
42. NORTH 45°54'35" EAST 258.10 feet;
43. NORTH 26°32'01" WEST 597.08 feet;
44. NORTH 07°45'04" EAST 393.13 feet;

45. **NORTH 57°54'01" EAST 296.97 feet;**
46. **NORTH 84°48'37" EAST 631.54 feet;**
47. **SOUTH 81°42'34" EAST 351.30 feet;**
48. **NORTH 73°24'27" EAST 167.19 feet;**
49. **SOUTH 85°10'09" EAST 329.37 feet;**
50. **NORTH 03°48'36" EAST 193.46 feet;**
51. **NORTH 36°35'05" EAST 278.68 feet;**
52. **NORTH 75°18'28" WEST 541.25 feet;**
53. **NORTH 43°14'42" WEST 434.09 feet;**
54. **NORTH 10°44'02" WEST 283.82 feet;**
55. **NORTH 03°39'15" WEST 251.39 feet;**
56. **NORTH 25°55'58" EAST 184.63 feet;**
57. **NORTH 29°00'08" WEST 314.54 feet;**
58. **NORTH 07°22'12" EAST 305.27 feet;**
59. **NORTH 38°26'17" EAST 296.65 feet;**
60. **NORTH 74°46'34" EAST 552.89 feet;**
61. **SOUTH 78°40'25" EAST 550.38 feet;**
62. **SOUTH 43°55'03" EAST 541.96 feet;**
63. **SOUTH 65°57'52" EAST 530.01 feet;**
64. **SOUTH 48°22'25" EAST 388.76 feet;**
65. **NORTH 23°34'05" EAST 279.31 feet;**
66. **NORTH 58°58'31" EAST 498.15 feet;**
67. **SOUTH 74°10'27" EAST 1120.61 feet;**
68. **NORTH 72°32'17" EAST 333.78 feet;**
69. **SOUTH 50°38'21" EAST 367.72 feet;**
70. **SOUTH 10°30'25" EAST 836.63 feet;**
71. **SOUTH 08°22'14" WEST 341.19 feet;**
72. **SOUTH 28°40'29" EAST 553.85 feet;**
73. **SOUTH 09°51'46" WEST 343.76 feet;**
74. **SOUTH 62°14'26" WEST 694.49 feet;**
75. **NORTH 79°50'48" WEST 1093.63 feet;**
76. **SOUTH 01°09'22" WEST 231.41 feet;**
77. **SOUTH 84°22'26" EAST 285.04 feet;**
78. **SOUTH 41°18'22" EAST 588.39 feet;**
79. **NORTH 84°49'50" EAST 193.67 feet;**
80. **SOUTH 74°05'40" EAST 395.51 feet;**
81. **NORTH 79°24'20" EAST 635.66 feet;**
82. **SOUTH 75°23'13" EAST 391.25 feet;**
83. **SOUTH 54°30'49" EAST 433.76 feet;**
84. **SOUTH 77°38'06" EAST 779.93 feet;**
85. **SOUTH 46°17'44" EAST 342.10 feet;**
86. **SOUTH 20°53'30" EAST 518.78 feet;**
87. **SOUTH 46°23'40" EAST 249.68 feet;**
88. **SOUTH 25°44'53" EAST 231.36 feet;**
89. **SOUTH 12°48'02" EAST 692.93** to the **POINT OF BEGINNING.**

PARCEL 3:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of N 1,918,486.92, E 6,182,012.53, said brass disc being **SOUTH 50°56'16" EAST 85,739.16** feet from NGS Monument "LOCKHEED" (PID DG6887); being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of N 1,972,516.68, E 6,115,439.35;

Thence from said **POINT OF COMMENCEMENT, NORTH 16°12'45" EAST 25,565.51** feet to a point with grid coordinates of N 1,943,035.77, E 6,189,150.44, said point being the **TRUE POINT OF BEGINNING** ;

Thence in a clockwise direction, the following fourteen (14) courses:

1. **NORTH 74°36'41" WEST 569.01 feet;**
2. **NORTH 13°39'18" WEST 380.96 feet;**
3. **NORTH 24°52'42" EAST 496.45 feet;**
4. **NORTH 30°32'54" WEST 373.29 feet;**
5. **NORTH 09°47'21" EAST 568.38 feet;**
6. **NORTH 23°23'26" EAST 778.36 feet;**
7. **NORTH 60°37'56" EAST 283.70 feet;**
8. **SOUTH 73°04'03" EAST 807.88 feet;**
9. **SOUTH 12°49'16" EAST 499.61 feet;**
10. **SOUTH 47°01'38" WEST 442.43 feet;**
11. **SOUTH 15°00'00" EAST 290.22 feet;**
12. **SOUTH 38°24'40" WEST 569.91 feet;**
13. **SOUTH 12°23'28" EAST 417.83** feet to a point, having grid coordinates of N 1,943,583.43, E 6,189,554.61, said point being **NORTH 66°40'48" WEST 6392.52** feet from the abovementioned NGS Monument "T 1474" (PID AI8041), having grid coordinates of N 1,941,052.84, E 6,195,424.92;

14. **SOUTH 36°25'36" WEST 680.65** to the **POINT OF BEGINNING.**

PARCEL 4:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of N 1,918,486.92, E 6,182,012.53, said brass disc being **SOUTH 50°56'16" EAST 85,739.16** feet from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of N 1,972,516.68, E 6,115,439.35;

Thence from said **POINT OF COMMENCEMENT, NORTH 23°16'51" EAST 23,383.20** feet to a point with grid coordinates of N 1,939,966.21, E 6,191,254.51, said point being the **TRUE POINT OF BEGINNING** ;

Thence in a clockwise direction, the following twelve (12) courses:

1. **NORTH 78°42'31" WEST 409.26 feet;**

2. NORTH 53°56'55" WEST 400.12 feet;
3. NORTH 61°39'57" WEST 696.67 feet;
4. NORTH 20°31'23" WEST 451.52 feet;
5. NORTH 35°54'15" EAST 429.74 feet;
6. NORTH 87°24'46" EAST 604.04 feet;
7. SOUTH 51°06'15" EAST 517.80 feet;
8. SOUTH 21°48'56" EAST 157.54 feet;
9. SOUTH 83°51'35" EAST 275.72 feet;
10. SOUTH 37°48'33" EAST 479.41 feet;
11. SOUTH 00°12'33" WEST 334.57 feet to a point, having grid coordinates of N 1,940,196.47, E 6,191,641.97, said point being SOUTH 77°14'40" WEST 3878.67 feet from the abovementioned NGS Monument "T 1474" (PID AI8041), having grid coordinates of N 1,941,052.84, E 6,195,424.92;

12. SOUTH 59°16'38" WEST 450.71 to the POINT OF BEGINNING.

PARCEL 5:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of N 1,918,486.92, E 6,182,012.53, said brass disc being SOUTH 50°56'16" EAST 85,739.16 feet from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of N 1,972,516.68, E 6,115,439.35;

Thence from said POINT OF COMMENCEMENT, NORTH 27°55'08" EAST 23,685.12 feet to a point with grid coordinates of N 1,939,415.35, E 6,193,102.43, said point being the TRUE POINT OF BEGINNING ;

Thence in a clockwise direction, the following seven (7) courses:

1. NORTH 19°55'10" EAST 455.93 feet;
2. NORTH 68°30'31" EAST 590.28 feet;
3. SOUTH 63°34'40" EAST 401.98 feet to a point, having grid coordinates of N 1,939,881.38, E 6,194,166.99, said point being SOUTH 47°02'18" WEST 1718.93 feet from the abovementioned NGS Monument "T 1474" (PID AI8041), having grid coordinates of N 1,941,052.84, E 6,195,424.92;

4. SOUTH 18°22'09" EAST 417.88 feet;
5. SOUTH 36°30'24" WEST 639.64 feet;
6. NORTH 82°20'23" WEST 547.28 feet;
7. NORTH 36°19'31" WEST 461.40 to the POINT OF BEGINNING.

PARCEL 6:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of N 1,918,486.92, E 6,182,012.53, said brass disc being **SOUTH 50°56'16" EAST 85,739.16** feet from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of N 1,972,516.68, E 6,115,439.35;

Thence from said **POINT OF COMMENCEMENT, NORTH 28°38'27" EAST 22,046.99** feet to a point with grid coordinates of N 1,937,836.30, E 6,192,580.00, said point being the **TRUE POINT OF BEGINNING** ;

Thence in a clockwise direction, the following eleven (11) courses:

1. **NORTH 13°17'26" EAST 529.34** feet;
2. **NORTH 80°12'50" EAST 442.07** feet;
3. **NORTH 58°24'10" EAST 566.84** feet;
4. **SOUTH 76°38'49" EAST 492.26** feet to a point, having grid coordinates of N 1,938,609.90, E 6,194,099.09, said point being **SOUTH 28°29'22" WEST 2779.53** feet from the abovementioned NGS Monument "T 1474" (PID AI8041), having grid coordinates of N 1,941,052.84, E 6,195,424.92;

5. **SOUTH 11°50'27" EAST 465.06** feet;
6. **SOUTH 39°59'51" WEST 490.17** feet;
7. **SOUTH 57°09'12" EAST 404.09** feet;
8. **SOUTH 06°27'23" EAST 467.74** feet;
9. **SOUTH 58°52'29" WEST 758.06** feet;
10. **NORTH 73°28'07" WEST 459.01** feet;
11. **NORTH 31°00'53" WEST 1169.46** to the **POINT OF BEGINNING.**

PARCEL 7:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of N 1,918,486.92, E 6,182,012.53, said brass disc being **SOUTH 50°56'16" EAST 85,739.16** feet from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of N 1,972,516.68, E 6,115,439.35;

Thence from said **POINT OF COMMENCEMENT, SOUTH 84°47'30" WEST 31,318.09** feet to a point with grid coordinates of N 1,915,644.01, E 6,150,823.75, said point being the **TRUE POINT OF BEGINNING** ;

Thence in a clockwise direction, the following fifteen (15) courses:

1. **SOUTH 39°03'58" EAST 778.56** feet;
2. **SOUTH 24°35'59" EAST 656.79** feet;
3. **SOUTH 04°21'38" WEST 531.65** feet;
4. **SOUTH 44°50'42" WEST 505.93** feet;
5. **NORTH 82°29'49" WEST 408.68** feet;
6. **SOUTH 18°18'09" EAST 285.72** feet;

7. **SOUTH 19°42'45" WEST 547.84 feet;**
8. **SOUTH 62°38'53" WEST 469.05 feet;**
9. **NORTH 60°44'30" WEST 482.97 feet;**
10. **NORTH 02°54'49" WEST 739.95 feet;**
11. **NORTH 51°07'25" EAST 513.39 feet to a point, having grid coordinates of N 1,913,579.42, E 6,149,814.79, said point being SOUTH 81°26'40" EAST 15078.97 feet from said NGS Monument "VASONA" (PID HS4911), having grid coordinates of N 1,915,822.69, E 6,134,903.61;**

12. **NORTH 15°04'55" WEST 457.69 feet;**
13. **NORTH 09°22'12" EAST 484.58 feet;**
14. **NORTH 06°00'55" EAST 709.36 feet;**
15. **NORTH 78°30'55" EAST 586.90 to the POINT OF BEGINNING.**

PARCEL 8:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of **N 1,918,486.92, E 6,182,012.53**, said brass disc being **SOUTH 50°56'16" EAST 85,739.16** feet from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of **N 1,972,516.68, E 6,115,439.35**;

Thence from said **POINT OF COMMENCEMENT, SOUTH 76°53'49" WEST 21,637.07** feet to a point with grid coordinates of **N 1,913,581.69, E 6,160,938.81**, said point being the **TRUE POINT OF BEGINNING** ;

Thence in a clockwise direction, the following twenty-four (24) courses:

1. **SOUTH 67°04'14" EAST 388.17 feet;**
2. **SOUTH 28°33'09" EAST 534.12 feet;**
3. **SOUTH 20°08'02" WEST 347.61 feet;**
4. **SOUTH 65°39'00" WEST 612.83 feet;**
5. **SOUTH 19°48'02" WEST 423.45 feet;**
6. **SOUTH 42°25'01" WEST 518.74 feet;**
7. **SOUTH 68°50'26" WEST 107.38 feet;**
8. **SOUTH 31°54'52" WEST 1022.39 feet to a point, having grid coordinates of N 1,910,694.27, E 6,159,739.65, said point being NORTH 63°27'41" WEST 9639.69 feet** from the abovementioned SCVWD Benchmark "BM395", having grid coordinates of **1,906,387.23, E 6,168,363.64;**

9. **SOUTH 69°03'43" WEST 668.30 feet;**
10. **NORTH 75°32'35" WEST 331.23 feet;**
11. **NORTH 45°13'31" WEST 213.18 feet;**
12. **SOUTH 69°55'28" WEST 413.76 feet;**
13. **NORTH 72°00'54" WEST 395.61 feet;**

14. **NORTH 20°53'43" WEST 713.14 feet;**
15. **NORTH 10°25'06" EAST 641.52 feet;**
16. **NORTH 49°57'14" EAST 502.01 feet;**
17. **SOUTH 89°16'03" EAST 491.36 feet;**
18. **SOUTH 33°43'11" EAST 242.57 feet;**
19. **NORTH 81°53'06" EAST 557.97 feet;**
20. **NORTH 48°06'58" EAST 335.20 feet;**
21. **NORTH 26°20'09" EAST 645.73 feet;**
22. **SOUTH 88°32'03" EAST 602.34 feet;**
23. **NORTH 11°13'01" EAST 471.01 feet;**
24. **NORTH 66°53'53" EAST 441.63** to the **POINT OF BEGINNING.**

PARCEL 9:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of **N 1,918,486.92, E 6,182,012.53,** said brass disc being **SOUTH 50°56'16" EAST 85,739.16 feet** from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of **N 1,972,516.68, E 6,115,439.35;**

Thence from said **POINT OF COMMENCEMENT, SOUTH 34°23'50" WEST 20,486.62 feet** to a point with grid coordinates of **N 1,901,582.58, E 6,170,439.09,** said point being the **TRUE POINT OF BEGINNING ;**

Thence in a clockwise direction, the following seventeen (17) courses:

1. **NORTH 84°48'49" EAST 1221.73 feet;**
2. **SOUTH 56°06'37" EAST 460.65 feet;**
3. **NORTH 77°13'36" EAST 438.85 feet;**
4. **SOUTH 71°24'42" EAST 472.44 feet;**
5. **SOUTH 32°59'25" EAST 1123.32 feet;**
6. **SOUTH 21°27'26" WEST 571.00 feet;**
7. **SOUTH 00°57'09" EAST 430.69 feet;**
8. **SOUTH 25°59'06" WEST 514.10 feet;**
9. **SOUTH 57°41'44" WEST 544.54 feet;**
10. **NORTH 67°13'32" WEST 581.99 feet;**
11. **NORTH 37°30'57" WEST 489.50 feet;**
12. **NORTH 53°23'15" WEST 341.46 feet;**
13. **NORTH 42°29'36" WEST 761.76 feet;**
14. **NORTH 60°39'35" WEST 677.49 feet;**
15. **NORTH 36°57'35" WEST 414.32 feet;**
16. **NORTH 00°28'59" EAST 546.88 feet** to a point, having grid coordinates of **N 1,901,313.96, E 6,170,179.96,** said point being **SOUTH 19°41'54" EAST 5388.61 feet** from the abovementioned SCVWD Benchmark "BM395", having grid coordinates of

1,906,387.23, E 6,168,363.64;

17. NORTH 43°58'07" EAST 373.23 to the POINT OF BEGINNING.

Containing 6,791,610,555 square feet of land (155,913.92 acres), more or less.

END OF DESCRIPTION

Basis of Bearings:
Bearings, coordinates, and distances used in above description are based on the California Coordinate System of 1983, Zone III, North American Datum of 1983 (CSRC) Epoch 2017.50. Distances are in grid unless otherwise noted, ground distances may be obtained by multiplying by a combination factor of 1.000037821 calculated at the abovementioned NGS Monument "QQ 453" (PID HS2787).

Surveyor's Statement:
This land description has been prepared by me, or under my direction, in conformance with the Professional Land Surveyors' Act.

Prepared By:

Frank A. Borges, P.L.S.

March 5, 2020
Date

FRANK A. BORGES
No. 7922
Exp: 12-31-21

Appendix L-5

Adopted Metes and Bounds for Amended Zone W-5

BOARD OF DIRECTORS
SANTA CLARA VALLEY WATER DISTRICT

RESOLUTION NO. 20-13

RESOLUTION AMENDING THE BOUNDARIES OF GROUNDWATER BENEFIT ZONE W-5

WHEREAS, the Santa Clara Valley Water District (Valley Water) is charged with managing the groundwater subbasins in Santa Clara County per the Santa Clara Valley Water District Act and the Sustainable Groundwater Management Act; and

WHEREAS, the Santa Clara Valley Water District Act authorizes the Valley Water Board of Directors to establish zones encompassing areas where groundwater pumpers benefit directly and indirectly from Valley Water activities to protect and augment water supplies; and

WHEREAS, by assessing a groundwater production charge on water producing facilities within the groundwater benefit zones, Valley Water funds and implements projects and activities for the benefit of groundwater pumpers in the zone, ensuring continued groundwater supply and sustainability, consistent with the purposes set forth in the District Act and requirements of the Sustainable Groundwater Management Act; and

WHEREAS, the Valley Water groundwater benefit zone W-5 was established in 1977 and last modified in 2008; and

WHEREAS, Valley Water's activities benefitting groundwater pumpers have changed, and new and more detailed information has become available regarding the groundwater subbasins Valley Water manages since the existing groundwater benefit zones were first established; and

WHEREAS, Valley Water undertook an independent, science-based study beginning in 2014 to ensure the zones reflect the most recent and relevant data regarding the services and benefits received by well owners and operators (well users); and

WHEREAS, Valley Water conducted the study with extensive public outreach including notices to potentially affected well users and interested parties, presentations to Valley Water Board of Directors committees and public agencies, meetings and communication with individual well users and water retailers, and open houses; and

WHEREAS, after completing the study using the best available science and considering information provided by well users, it was determined that all well users in proposed modified Zone W-5 are benefiting in a reasonably similar way from Valley Water activities to protect and augment groundwater supplies; and

WHEREAS, the results of the study and the proposed modification of Zone W-5 were presented to the Board of Directors on August 27, 2019, and October 8, 2019; and

WHEREAS, on October 8, 2019, the Board of Directors directed staff to prepare metes and bounds for modified groundwater benefit zone W-5 for consideration at a public hearing.

NOW, THEREFORE BE IT RESOLVED that the Board of Directors of the Santa Clara Valley Water District declares as follows:

1. The boundaries of groundwater benefit zone W-5 are amended as described in Exhibit A.
2. The amended groundwater benefit zone W-5 shall become effective on July 1, 2020.

PASSED AND ADOPTED by the Board of Directors of the Santa Clara Valley Water District by the following vote on April 28, 2020:

AYES: Directors R. Santos, G. Kremen, T. Estremera, N. Hsueh
B. Keegan, L. LeZotte, J. Varela
NOES: Directors None

ABSENT: Directors None

ABSTAIN: Directors None

SANTA CLARA VALLEY WATER DISTRICT

NAI HSUEH
Chair, Board of Directors

ATTEST: MICHELE L. KING, CMC

Michele L. King
Clerk, Board of Directors

EXHIBIT A
COVERSHEET

METES AND BOUNDS DESCRIPTION FOR SANTA CLARA VALLEY WATER DISTRICT GROUNDWATER BENEFIT ZONE W-5 AT SANTA CLARA COUNTY, CALIFORNIA

No. of Pages:	36
Exhibit Attachments:	Attachment 1: Metes and Bounds Description for Santa Clara Valley Water District Groundwater Benefit Zone W-5 at Santa Clara County, California

METES AND BOUNDS DESCRIPTION
FOR
SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT ZONE W-5
AT
SANTA CLARA COUNTY, CALIFORNIA

ALL THAT CERTAIN AREA situate in the County of Santa Clara, State of California, being more particularly described as follows:

COMMENCING at NGS Monument “M 362” (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of **N 1,884,274.45, E 6,233,024.82,** said railroad spike being **NORTH 16°38'26" WEST 64,286.80 feet** from NGS Monument “C 1193” (PID GU2195), being a 3-inch brass disc, punched and stamped “C 1193 1968”, having grid coordinates of **N 1,822,679.97, E 6,251,434.42;**

Thence from said **Point of Commencement, SOUTH 15°06'15" WEST 1950.06 feet** to a point with grid coordinates of **N 1,882,391.76, E 6,232,516.68,** said point being the **TRUE POINT OF BEGINNING;**

Thence the following one thousand two hundred seventy-nine (1,279) courses:

1) **SOUTH 55°41'00” EAST 117.74 feet;**
2) **SOUTH 69°07'16” EAST 269.96 feet;**
3) **SOUTH 54°34'53” EAST 534.66 feet;**
4) **SOUTH 19°39'30” EAST 213.43 feet;**
5) **SOUTH 40°32'47” EAST 261.62 feet;**
6) **SOUTH 11°00'22” EAST 637.40 feet;**
7) **SOUTH 24°41'52” EAST 596.78 feet;**
8) **SOUTH 39°44'28” EAST 712.73 feet;**
9) **SOUTH 22°48'04” WEST 270.47 feet;**
10) **SOUTH 00°05'09” EAST 583.31 feet;**
11) **SOUTH 26°13'57” EAST 672.47 feet;**
12) **SOUTH 63°44'01” EAST 678.75 feet;**
13) **NORTH 78°16'15” EAST 428.62 feet;**
14) **SOUTH 26°38'39” EAST 196.44 feet;**
15) **SOUTH 61°18'41” EAST 557.31 feet;**
16) **NORTH 81°53'24” EAST 340.24 feet;**
17) **SOUTH 34°50'06” EAST 225.78 feet;**
18) **SOUTH 50°04'25” EAST 194.27 feet;**
19) **SOUTH 10°57'44” EAST 141.82 feet;**
20) **SOUTH 40°03'06” EAST 187.54 feet;**
21) **SOUTH 75°18'40” EAST 297.77 feet;**
22) **SOUTH 40°01'25” EAST 211.26 feet;**
23) **SOUTH 70°16'53” EAST 190.39 feet;**

24) SOUTH 31°34'45” EAST 335.32 feet;
25) SOUTH 70°39'57” EAST 208.04 feet;
26) SOUTH 37°30'52” EAST 340.90 feet;
27) SOUTH 73°57'51” EAST 222.13 feet;
28) SOUTH 44°00'13” EAST 279.62 feet;
29) SOUTH 69°55'58” EAST 149.59 feet;
30) NORTH 83°50'04” EAST 175.55 feet;
31) SOUTH 36°44'40” EAST 93.79 feet;
32) SOUTH 56°50'36” EAST 246.43 feet;
33) SOUTH 82°03'21” EAST 200.34 feet;
34) SOUTH 08°54'25” EAST 86.03 feet;
35) SOUTH 29°48'32” EAST 151.71 feet;
36) SOUTH 54°22'03” EAST 564.82 feet;
37) SOUTH 79°51'38” EAST 201.10 feet;
38) SOUTH 44°35'18” EAST 59.92 feet to a point, having grid coordinates of N 1,875,083.79, E 6,240,085.57, said point being SOUTH 74°56'30" WEST 2468.81 feet from NGS Monument “M 368” (PID HS5369), being a 2-inch brass disc inside a monument well with no stamp, having grid coordinates of N 1,875,725.20, E 6,242,469.61;

39) SOUTH 02°57'43” WEST 316.92 feet;
40) SOUTH 08°07'03” EAST 90.42 feet;
41) SOUTH 24°46'18” EAST 899.71 feet;
42) SOUTH 44°10'17” EAST 459.27 feet;
43) SOUTH 60°03'28” EAST 172.59 feet;
44) SOUTH 11°33'57” EAST 151.15 feet;
45) SOUTH 35°39'43” EAST 885.43 feet;
46) SOUTH 49°21'36” EAST 145.80 feet;
47) SOUTH 77°53'43” EAST 177.10 feet;
48) SOUTH 41°02'12” EAST 100.72 feet;
49) SOUTH 58°31'45” EAST 100.40 feet;
50) SOUTH 28°41'02” EAST 83.30 feet;
51) SOUTH 43°49'05” EAST 88.62 feet;
52) SOUTH 15°55'16” EAST 197.56 feet to a point, having grid coordinates of N 1,871,990.36, E 6,242,066.11, said point being SOUTH 87°57'45" WEST 140.87 feet from NGS Monument “M 174” (PID HS5336), being an open 3/4-inch iron pipe 3-inch below surface, having grid coordinates of N 1,871,995.36, E 6,242,206.89;

53) SOUTH 46°03'15” EAST 206.81 feet;
54) SOUTH 06°28'16” EAST 302.05 feet;
55) SOUTH 33°42'58” EAST 404.15 feet;
56) SOUTH 51°20'26” EAST 760.48 feet;
57) SOUTH 73°54'01” EAST 241.85 feet;
58) SOUTH 36°46'47” EAST 212.96 feet;

59) SOUTH 74°26'17" EAST 227.94 feet;
60) SOUTH 22°20'35" EAST 325.15 feet;
61) SOUTH 36°56'39" EAST 165.41 feet;
62) SOUTH 64°18'17" EAST 313.84 feet;
63) SOUTH 10°57'14" EAST 193.78 feet;
64) SOUTH 37°27'42" EAST 781.57 feet;
65) SOUTH 53°02'12" EAST 113.50 feet;
66) SOUTH 17°04'08" WEST 42.95 feet;
67) SOUTH 82°56'04" WEST 177.64 feet;
68) SOUTH 63°36'58" WEST 217.07 feet;
69) SOUTH 40°39'37" WEST 422.44 feet;
70) SOUTH 20°20'03" WEST 913.22 feet;
71) SOUTH 05°49'05" EAST 485.13 feet;
72) SOUTH 12°14'46" WEST 554.19 feet;
73) SOUTH 09°06'24" EAST 975.02 feet;
74) SOUTH 01°36'18" WEST 635.55 feet;
75) SOUTH 20°55'36" EAST 514.94 feet;
76) SOUTH 33°01'11" EAST 491.98 feet;
77) SOUTH 44°14'57" EAST 951.17 feet;
78) SOUTH 53°17'32" EAST 905.85 feet;
79) SOUTH 80°13'19" EAST 581.98 feet;
80) SOUTH 76°24'27" EAST 778.93 feet;
81) SOUTH 65°24'12" EAST 643.79 feet;
82) SOUTH 45°51'59" EAST 480.28 feet;
83) SOUTH 73°35'54" EAST 461.59 feet;
84) SOUTH 22°27'04" EAST 1014.26 feet;
85) SOUTH 42°49'43" EAST 143.69 feet;
86) SOUTH 05°04'29" WEST 717.50 feet;
87) SOUTH 09°06'18" EAST 832.17 feet;
88) SOUTH 27°26'20" EAST 206.40 feet;
89) SOUTH 48°41'53" EAST 345.84 feet to a point, having grid coordinates of N 1,858,908.94, E 6,249,301.20, said point being NORTH 42°35'45" EAST 69.22 feet from NGS Monument "HPGN D CA NEW" (PID AA1859), being a 2.5-inch aluminum disc, punched and stamped "NEW HPGN-D 1992", having grid coordinates of N 1,858,857.98, E 6,249,254.35;

90) SOUTH 10°42'33" WEST 317.04 feet;
91) SOUTH 10°34'41" EAST 584.53 feet;
92) SOUTH 32°33'30" EAST 659.79 feet;
93) SOUTH 44°58'16" EAST 749.79 feet;
94) SOUTH 63°41'29" EAST 699.23 feet;
95) SOUTH 86°49'32" EAST 323.68 feet;
96) SOUTH 26°28'43" EAST 732.95 feet;
97) SOUTH 58°06'02" EAST 500.28 feet;

98) SOUTH 83°19'55" EAST 441.72 feet;
99) SOUTH 51°40'40" EAST 798.37 feet;
100) SOUTH 86°10'02" EAST 260.67 feet;
101) SOUTH 33°58'06" EAST 635.52 feet;
102) SOUTH 55°42'17" EAST 975.87 feet;
103) SOUTH 30°52'01" WEST 301.18 feet;
104) SOUTH 11°07'37" WEST 342.80 feet;
105) SOUTH 07°19'33" EAST 643.49 feet;
106) SOUTH 46°02'40" WEST 398.68 feet;
107) SOUTH 04°27'25" EAST 242.33 feet;
108) SOUTH 48°38'14" EAST 264.78 feet;
109) SOUTH 15°04'06" WEST 138.68 feet;
110) SOUTH 09°29'55" EAST 193.97 feet;
111) SOUTH 42°28'55" WEST 361.77 feet;
112) SOUTH 21°28'34" WEST 235.21 feet;
113) SOUTH 20°42'32" EAST 467.19 feet;
114) SOUTH 09°36'09" WEST 427.52 feet;
115) SOUTH 40°37'36" WEST 134.59 feet;
116) SOUTH 10°49'59" WEST 729.60 feet;
117) SOUTH 08°23'56" EAST 1078.27 feet;
118) SOUTH 23°11'03" EAST 344.04 feet;
119) SOUTH 35°50'36" EAST 662.47 feet;
120) SOUTH 47°47'36" EAST 316.70 feet;
121) SOUTH 70°35'02" EAST 280.08 feet;
122) SOUTH 36°36'10" EAST 783.70 feet;
123) SOUTH 72°01'06" EAST 393.26 feet;
124) SOUTH 31°35'00" EAST 259.93 feet;
125) SOUTH 53°11'28" EAST 1421.52 feet;
126) SOUTH 72°44'42" EAST 554.50 feet;
127) NORTH 83°39'49" EAST 640.73 feet;
128) SOUTH 63°18'40" EAST 317.43 feet;
129) SOUTH 83°53'20" EAST 429.14 feet;
130) SOUTH 45°36'47" EAST 1405.56 feet;
131) SOUTH 31°57'16" EAST 358.31 feet;
132) SOUTH 49°24'44" EAST 1321.13 feet to a point, having grid coordinates of N 1,843,154.43, E 6,261,118.38, said point being NORTH 28°16'21" EAST 2751.39 feet from SCVWD Benchmark "BM428", being a 2.5-inch aluminum disc inside a monument box, having grid coordinates of N 1,840,731.27, E 6,259,815.14;

133) SOUTH 68°01'54" EAST 370.45 feet;
134) NORTH 88°40'12" EAST 542.14 feet;
135) SOUTH 38°49'26" EAST 770.45 feet;
136) SOUTH 52°15'51" EAST 544.14 feet;
137) SOUTH 15°12'40" EAST 532.04 feet;

138) SOUTH 25°16'28" EAST 1030.05 feet;
139) SOUTH 10°50'59" EAST 648.00 feet;
140) SOUTH 28°45'10" EAST 201.71 feet;
141) SOUTH 69°38'46" EAST 362.84 feet;
142) SOUTH 30°28'15" EAST 1291.82 feet;
143) SOUTH 17°34'44" EAST 489.13 feet;
144) SOUTH 35°40'38" EAST 1017.41 feet;
145) SOUTH 49°28'33" EAST 849.54 feet;
146) SOUTH 23°34'05" EAST 748.05 feet;
147) SOUTH 38°44'09" EAST 1577.40 feet;
148) SOUTH 24°21'08" EAST 557.45 feet;
149) SOUTH 07°40'50" EAST 1247.69 feet to a point, having grid coordinates of N 1,833,092.27, E 6,267,780.53, said point being NORTH 84°12'40" EAST 5237.59 feet from SCVWD Benchmark "BM554", being a 2.5-inch aluminum disc, punched and stamped "BM-554 2008" having grid coordinates of N 1,832,563.99, E 6,262,569.66;

150) SOUTH 37°53'47" EAST 601.39 feet;
151) SOUTH 25°47'02" EAST 948.46 feet;
152) SOUTH 48°15'12" EAST 461.90 feet;
153) SOUTH 79°55'58" EAST 237.36 feet;
154) SOUTH 33°29'57" EAST 596.39 feet;
155) SOUTH 47°21'23" EAST 1262.03 feet;
156) SOUTH 71°55'11" EAST 483.65 feet;
157) SOUTH 03°48'43" EAST 591.63 feet;
158) SOUTH 22°06'48" EAST 482.18 feet;
159) SOUTH 41°03'47" WEST 178.07 feet;
160) SOUTH 18°48'32" WEST 658.48 feet;
161) SOUTH 37°39'31" WEST 499.30 feet;
162) SOUTH 01°39'06" EAST 463.95 feet;
163) SOUTH 32°06'54" EAST 390.24 feet;
164) SOUTH 30°40'18" WEST 185.03 feet;
165) SOUTH 06°09'06" WEST 245.85 feet;
166) SOUTH 22°39'50" EAST 464.98 feet;
167) SOUTH 44°06'50" EAST 1631.18 feet;
168) SOUTH 17°04'11" EAST 1149.72 feet;
169) SOUTH 42°36'25" EAST 153.01 feet;
170) SOUTH 16°56'07" WEST 644.46 feet;
171) SOUTH 02°16'58" WEST 165.98 feet;
172) SOUTH 11°04'49" EAST 484.19 feet;
173) SOUTH 02°38'27" EAST 546.74 feet;
174) SOUTH 15°16'36" EAST 827.10 feet;
175) SOUTH 40°28'43" EAST 573.06 feet;
176) SOUTH 64°01'48" EAST 627.92 feet;
177) SOUTH 29°02'42" EAST 432.71 feet;

178) SOUTH 73°07'37" EAST 343.28 feet;
179) SOUTH 22°55'01" EAST 135.24 feet;
180) SOUTH 22°55'01" EAST 512.71 feet;
181) SOUTH 54°20'18" EAST 530.62 feet;
182) SOUTH 25°50'57" WEST 119.52 feet;
183) SOUTH 00°48'57" EAST 182.51 feet;
184) SOUTH 33°39'29" EAST 716.08 feet;
185) SOUTH 54°23'11" EAST 425.77 feet;
186) SOUTH 29°04'33" WEST 903.84 feet to a point, having grid coordinates of N 1,817,092.12, E 6,274,855.00, said point being SOUTH 74°19'43" EAST 4670.92 feet from SCVWD Benchmark "BM555", being a 3-inch brass disc, punched and stamped "DEPARTMENT OF THE INTERIOR U.S. BUREAU OF RECLAMATION", having grid coordinates of N 1,818,353.83, E 6,270,357.71;

187) NORTH 69°26'05" WEST 1241.26 feet;
188) NORTH 69°25'10" WEST 563.80 feet;
189) NORTH 69°25'11" WEST 358.69 feet;
190) NORTH 69°25'11" WEST 33.54 feet;
191) SOUTH 39°20'38" WEST 119.97 feet;
192) SOUTH 39°08'38" WEST 65.17 feet;
193) SOUTH 39°36'52" WEST 48.26 feet;
194) SOUTH 42°28'17" WEST 146.19 feet;
195) SOUTH 42°47'39" WEST 64.37 feet;
196) SOUTH 42°32'18" WEST 855.03 feet;
197) SOUTH 42°33'10" WEST 1531.84 feet;
198) SOUTH 42°33'10" WEST 1032.75 feet;
199) SOUTH 42°34'31" WEST 628.25 feet;
200) SOUTH 42°34'48" WEST 226.73 feet;
201) SOUTH 42°27'43" WEST 777.68 feet;
202) SOUTH 41°14'39" WEST 117.54 feet;
203) SOUTH 21°36'54" WEST 180.97 feet;
204) SOUTH 30°49'30" EAST 8.96 feet;
205) SOUTH 35°25'39" WEST 13.30 feet;
206) SOUTH 17°21'34" WEST 9.13 feet;
207) SOUTH 46°02'00" WEST 17.64 feet;
208) SOUTH 15°04'27" WEST 10.53 feet;
209) SOUTH 37°31'37" WEST 21.40 feet;
210) SOUTH 19°47'09" WEST 127.21 feet;
211) SOUTH 17°21'36" WEST 54.75 feet;
212) SOUTH 13°14'59" WEST 25.37 feet;
213) SOUTH 35°01'25" WEST 36.19 feet;
214) SOUTH 37°57'58" WEST 37.56 feet;
215) SOUTH 44°16'16" WEST 18.62 feet;
216) SOUTH 33°18'37" WEST 28.12 feet;

217) SOUTH 40°26'59” WEST 59.75 feet;
218) SOUTH 34°42'43” WEST 42.21 feet;
219) SOUTH 35°54'47” WEST 7.58 feet;
220) SOUTH 39°10'13” WEST 69.84 feet;
221) SOUTH 17°21'35” WEST 18.25 feet;
222) SOUTH 41°23'40” WEST 19.23 feet;
223) SOUTH 19°35'27” WEST 16.17 feet;
224) SOUTH 46°49'28” WEST 10.52 feet;
225) SOUTH 20°01'11” WEST 31.66 feet;
226) SOUTH 36°56'58” WEST 21.70 feet;
227) SOUTH 22°28'29” WEST 94.16 feet;
228) SOUTH 17°40'11” WEST 12.95 feet;
229) SOUTH 33°07'12” WEST 14.68 feet;
230) SOUTH 15°04'35” WEST 10.53 feet;
231) SOUTH 32°08'50” WEST 14.52 feet;
232) SOUTH 18°47'13” WEST 42.15 feet;
233) SOUTH 35°01'28” WEST 18.09 feet;
234) SOUTH 21°40'43” WEST 29.26 feet;
235) SOUTH 14°31'05” WEST 35.26 feet;
236) SOUTH 21°58'42” WEST 62.56 feet;
237) SOUTH 35°01'29” WEST 18.09 feet;
238) SOUTH 12°47'42” WEST 63.70 feet;
239) SOUTH 33°28'13” WEST 71.08 feet;
240) SOUTH 43°33'42” WEST 74.61 feet;
241) SOUTH 46°46'40” WEST 24.71 feet;
242) SOUTH 54°05'36” WEST 25.08 feet;
243) SOUTH 74°12'05” WEST 83.76 feet;
244) SOUTH 53°01'43” WEST 12.54 feet;
245) NORTH 86°38'29” WEST 7.60 feet;
246) SOUTH 56°45'00” WEST 9.15 feet;
247) SOUTH 46°32'09” WEST 60.19 feet;
248) SOUTH 18°02'49” WEST 26.33 feet;
249) SOUTH 01°18'00” EAST 52.46 feet;
250) SOUTH 10°54'13” EAST 23.41 feet;
251) SOUTH 35°00'14” EAST 12.54 feet;
252) SOUTH 13°36'57” EAST 72.50 feet;
253) SOUTH 04°24'48” EAST 83.34 feet;
254) SOUTH 19°52'34” WEST 23.91 feet;
255) SOUTH 12°29'38” WEST 38.32 feet;
256) SOUTH 32°12'52” WEST 64.12 feet;
257) SOUTH 34°06'49” WEST 59.82 feet;
258) SOUTH 41°20'56” WEST 19.70 feet;
259) SOUTH 19°17'00” WEST 65.72 feet;
260) SOUTH 06°45'48” WEST 133.67 feet;

261) SOUTH 01°41'04" WEST 62.64 feet;
262) SOUTH 09°10'18" WEST 47.13 feet;
263) SOUTH 25°00'42" WEST 9.20 feet;
264) SOUTH 05°07'04" WEST 57.49 feet;
265) SOUTH 05°07'04" WEST 20.67 feet;
266) SOUTH 22°06'55" WEST 21.52 feet;
267) SOUTH 01°44'11" WEST 14.93 feet;
268) SOUTH 07°29'26" WEST 49.31 feet;
269) SOUTH 07°29'26" WEST 92.25 feet;
270) SOUTH 33°07'22" WEST 14.68 feet;
271) SOUTH 20°34'25" WEST 53.07 feet;
272) SOUTH 41°20'56" WEST 19.70 feet;
273) SOUTH 12°36'24" WEST 12.66 feet;
274) SOUTH 35°01'36" WEST 36.19 feet;
275) SOUTH 17°21'48" WEST 20.76 feet;
276) SOUTH 17°21'48" WEST 15.75 feet;
277) SOUTH 01°34'23" WEST 20.70 feet;
278) SOUTH 01°34'23" WEST 14.26 feet;
279) SOUTH 08°16'27" EAST 43.49 feet;
280) SOUTH 36°04'31" EAST 12.71 feet;
281) SOUTH 09°38'23" WEST 70.78 feet;
282) SOUTH 41°26'53" WEST 31.28 feet;
283) SOUTH 30°18'23" WEST 15.93 feet;
284) SOUTH 43°14'38" WEST 67.30 feet;
285) SOUTH 48°07'48" WEST 32.88 feet;
286) SOUTH 60°00'23" WEST 33.61 feet;
287) SOUTH 56°11'20" WEST 21.25 feet;
288) SOUTH 74°01'19" WEST 42.07 feet;
289) SOUTH 88°29'08" WEST 235.07 feet;
290) NORTH 88°20'55" WEST 20.16 feet;
291) NORTH 51°47'55" WEST 12.54 feet;
292) SOUTH 75°30'24" WEST 36.32 feet;
293) SOUTH 88°13'48" WEST 87.44 feet;
294) SOUTH 83°33'36" WEST 133.37 feet;
295) SOUTH 75°59'15" WEST 44.69 feet;
296) SOUTH 54°22'28" WEST 12.32 feet;
297) SOUTH 80°45'10" WEST 12.75 feet;
298) SOUTH 79°38'44" WEST 13.39 feet;
299) NORTH 87°47'45" WEST 13.15 feet;
300) SOUTH 86°29'07" WEST 40.43 feet;
301) SOUTH 13°53'46" WEST 12.72 feet;
302) SOUTH 00°37'02" WEST 25.85 feet;
303) SOUTH 09°44'06" WEST 12.91 feet;
304) SOUTH 21°18'19" WEST 13.23 feet;

305) SOUTH 41°04'07” WEST 30.62 feet;
306) SOUTH 42°00'57” WEST 34.46 feet;
307) SOUTH 34°16'06” WEST 38.49 feet;
308) SOUTH 27°52'39” WEST 38.91 feet;
309) SOUTH 36°35'10” WEST 51.74 feet;
310) SOUTH 27°55'18” WEST 64.33 feet;
311) SOUTH 18°47'28” WEST 25.29 feet;
312) SOUTH 21°52'38” WEST 25.79 feet;
313) SOUTH 22°50'53” WEST 63.33 feet;
314) SOUTH 14°56'26” WEST 33.07 feet;
315) SOUTH 14°09'13” WEST 18.73 feet;
316) SOUTH 21°52'42” WEST 12.89 feet;
317) SOUTH 14°04'11” WEST 38.94 feet;
318) SOUTH 07°28'53” WEST 124.69 feet;
319) SOUTH 07°37'35” WEST 131.70 feet;
320) SOUTH 03°53'56” WEST 25.53 feet;
321) SOUTH 08°50'03” WEST 50.62 feet;
322) SOUTH 08°50'03” WEST 158.87 feet;
323) SOUTH 08°50'03” WEST 21.54 feet;
324) SOUTH 06°35'34” WEST 25.26 feet;
325) SOUTH 12°46'06” WEST 167.97 feet;
326) SOUTH 07°39'13” WEST 4.77 feet;
327) SOUTH 11°06'35” WEST 33.70 feet;
328) SOUTH 24°38'47” WEST 25.12 feet;
329) SOUTH 20°19'02” WEST 25.14 feet;
330) SOUTH 16°25'54” WEST 25.73 feet;
331) SOUTH 24°54'46” WEST 12.78 feet;
332) SOUTH 34°12'28” WEST 12.68 feet;
333) SOUTH 42°41'38” WEST 51.02 feet;
334) SOUTH 41°49'08” WEST 15.97 feet;
335) SOUTH 42°35'53” WEST 48.49 feet;
336) SOUTH 43°28'34” WEST 15.89 feet;
337) SOUTH 42°39'50” WEST 51.48 feet;
338) SOUTH 52°47'14” WEST 25.53 feet;
339) SOUTH 43°24'59” WEST 12.90 feet;
340) SOUTH 52°56'29” WEST 26.21 feet;
341) SOUTH 65°16'14” WEST 39.12 feet;
342) SOUTH 82°33'30” WEST 12.98 feet;
343) SOUTH 69°22'23” WEST 39.19 feet;
344) SOUTH 77°51'12” WEST 26.36 feet;
345) NORTH 89°22'51” WEST 13.15 feet;
346) SOUTH 85°47'22” WEST 51.90 feet;
347) NORTH 87°01'45” WEST 26.61 feet;
348) NORTH 80°51'20” WEST 39.30 feet;

349) NORTH 78°20'48" WEST 78.00 feet;
350) NORTH 86°12'39" WEST 26.34 feet;
351) SOUTH 76°46'52" WEST 25.88 feet;
352) SOUTH 80°04'36" WEST 91.54 feet;
353) SOUTH 75°23'42" WEST 26.35 feet;
354) SOUTH 65°50'42" WEST 26.07 feet;
355) SOUTH 69°25'47" WEST 14.10 feet;
356) SOUTH 71°42'13" WEST 12.35 feet;
357) SOUTH 58°41'41" WEST 26.16 feet;
358) SOUTH 54°16'59" WEST 52.23 feet;
359) SOUTH 41°54'35" WEST 25.68 feet;
360) SOUTH 46°44'32" WEST 51.48 feet;
361) SOUTH 42°20'38" WEST 4.39 feet;
362) SOUTH 41°52'32" WEST 20.83 feet;
363) SOUTH 31°23'22" WEST 26.27 feet;
364) SOUTH 33°54'30" WEST 36.69 feet;
365) SOUTH 33°54'30" WEST 1.64 feet;
366) SOUTH 30°49'41" WEST 21.49 feet;
367) SOUTH 11°02'25" EAST 13.01 feet;
368) SOUTH 00°41'38" EAST 16.08 feet;
369) SOUTH 00°41'38" EAST 9.42 feet;
370) SOUTH 05°27'31" EAST 77.26 feet;
371) SOUTH 09°15'55" EAST 64.68 feet;
372) SOUTH 07°59'08" EAST 53.77 feet;
373) SOUTH 07°59'08" EAST 10.68 feet;
374) SOUTH 14°16'24" EAST 64.80 feet;
375) SOUTH 26°38'55" EAST 50.38 feet;
376) SOUTH 30°25'26" EAST 25.50 feet;
377) SOUTH 34°03'24" EAST 38.52 feet;
378) SOUTH 43°08'23" EAST 104.35 feet;
379) SOUTH 51°28'08" EAST 38.52 feet;
380) SOUTH 56°18'45" EAST 38.70 feet;
381) SOUTH 59°10'46" EAST 51.39 feet;
382) SOUTH 48°24'27" EAST 12.77 feet;
383) SOUTH 60°33'39" EAST 25.68 feet;
384) SOUTH 54°41'15" EAST 25.59 feet;
385) SOUTH 57°04'48" EAST 47.01 feet;
386) SOUTH 57°27'24" EAST 29.61 feet;
387) SOUTH 54°07'09" EAST 63.70 feet;
388) SOUTH 57°37'47" EAST 51.20 feet;
389) SOUTH 51°28'12" EAST 38.52 feet;
390) SOUTH 45°55'29" EAST 38.64 feet;
391) SOUTH 42°10'50" EAST 25.80 feet;
392) SOUTH 29°18'07" EAST 63.85 feet;

393) SOUTH 23°02'58” EAST 51.68 feet;
394) SOUTH 17°33'26” EAST 25.29 feet;
395) SOUTH 07°19'55” EAST 141.54 feet;
396) SOUTH 00°52'41” WEST 64.45 feet;
397) SOUTH 06°00'46” WEST 12.43 feet;
398) SOUTH 00°40'37” EAST 25.86 feet;
399) SOUTH 05°56'05” WEST 25.23 feet;
400) SOUTH 00°17'23” WEST 50.98 feet;
401) SOUTH 05°12'25” WEST 25.57 feet;
402) SOUTH 01°55'11” WEST 38.61 feet;
403) SOUTH 03°41'44” WEST 76.21 feet;
404) SOUTH 07°48'22” WEST 25.69 feet;
405) SOUTH 00°21'34” EAST 51.35 feet;
406) SOUTH 04°33'13” WEST 25.55 feet;
407) SOUTH 00°18'27” WEST 269.08 feet;
408) SOUTH 02°35'17” WEST 14.59 feet;
409) SOUTH 02°35'17” WEST 10.91 feet;
410) SOUTH 10°46'18” WEST 89.52 feet;
411) SOUTH 17°40'41” WEST 38.85 feet;
412) SOUTH 23°59'23” WEST 25.78 feet;
413) SOUTH 19°04'29” WEST 38.77 feet;
414) SOUTH 32°18'28” WEST 38.94 feet;
415) SOUTH 46°03'33” WEST 25.43 feet;
416) SOUTH 42°54'27” WEST 51.68 feet;
417) SOUTH 54°21'14” WEST 38.78 feet;
418) SOUTH 69°17'52” WEST 26.04 feet;
419) SOUTH 64°41'52” WEST 183.25 feet;
420) SOUTH 77°51'18” WEST 13.18 feet;
421) SOUTH 70°16'21” WEST 26.18 feet;
422) SOUTH 62°37'07” WEST 51.96 feet;
423) SOUTH 55°32'39” WEST 64.63 feet;
424) SOUTH 62°06'43” WEST 12.97 feet;
425) SOUTH 49°09'48” WEST 52.25 feet;
426) SOUTH 36°21'27” WEST 13.01 feet;
427) SOUTH 30°17'01” WEST 25.98 feet;
428) SOUTH 01°42'53” WEST 15.30 feet;
429) SOUTH 15°35'49” WEST 26.01 feet;
430) SOUTH 04°31'58” WEST 64.23 feet;
431) SOUTH 05°55'15” EAST 25.65 feet;
432) SOUTH 09°11'41” EAST 147.44 feet;
433) SOUTH 08°30'00” EAST 5.53 feet;
434) SOUTH 15°11'46” EAST 12.87 feet;
435) SOUTH 04°17'42” EAST 51.16 feet;
436) SOUTH 12°17'47” EAST 13.07 feet;

437) SOUTH 20°11'45" EAST 51.81 feet;
438) SOUTH 38°07'49" EAST 13.07 feet;
439) SOUTH 00°41'41" EAST 12.75 feet;
440) SOUTH 18°24'43" EAST 90.51 feet;
441) SOUTH 08°37'48" EAST 25.45 feet;
442) SOUTH 03°47'35" EAST 37.98 feet;
443) SOUTH 01°16'33" WEST 25.49 feet;
444) SOUTH 02°18'06" EAST 63.07 feet;
445) SOUTH 06°00'56" EAST 25.29 feet;
446) SOUTH 00°37'10" WEST 25.12 feet;
447) SOUTH 02°42'33" EAST 50.33 feet;
448) SOUTH 07°09'35" WEST 12.83 feet;
449) SOUTH 03°22'41" EAST 138.33 feet;
450) SOUTH 18°11'00" EAST 12.69 feet;
451) SOUTH 02°05'01" EAST 24.79 feet;
452) SOUTH 07°56'19" EAST 88.37 feet;
453) SOUTH 01°35'26" EAST 37.90 feet;
454) SOUTH 02°55'06" WEST 7.29 feet;
455) SOUTH 02°38'51" WEST 24.77 feet;
456) SOUTH 04°05'07" WEST 19.33 feet;
457) SOUTH 03°25'52" EAST 12.41 feet;
458) SOUTH 03°54'01" WEST 25.53 feet;
459) SOUTH 04°46'25" EAST 12.43 feet;
460) SOUTH 12°57'59" WEST 4.10 feet;
461) SOUTH 17°22'12" WEST 9.13 feet;
462) SOUTH 00°28'32" EAST 15.30 feet;
463) SOUTH 23°42'43" WEST 12.67 feet;
464) SOUTH 12°42'00" WEST 16.76 feet;
465) SOUTH 12°09'09" WEST 21.92 feet;
466) SOUTH 09°18'42" WEST 38.68 feet;
467) SOUTH 23°42'43" WEST 12.67 feet;
468) SOUTH 04°09'10" WEST 18.97 feet;
469) SOUTH 04°33'18" WEST 12.77 feet;
470) SOUTH 18°25'07" WEST 51.63 feet;
471) SOUTH 10°43'50" WEST 3.33 feet;
472) SOUTH 14°53'51" WEST 61.62 feet;
473) SOUTH 17°11'03" WEST 64.58 feet;
474) SOUTH 11°48'19" WEST 25.61 feet;
475) SOUTH 14°58'26" WEST 51.87 feet;
476) SOUTH 12°23'24" WEST 38.68 feet;
477) SOUTH 15°47'00" WEST 29.05 feet;
478) SOUTH 15°35'56" WEST 9.05 feet;
479). SOUTH 24°55'03" WEST 25.57 feet;
480) SOUTH 13°42'58" WEST 51.59 feet;

481) SOUTH 20°39'48" WEST 38.37 feet;
482) SOUTH 26°27'07" WEST 25.49 feet;
483) SOUTH 17°55'12" WEST 76.65 feet;
484) SOUTH 16°07'21" WEST 51.39 feet;
485) SOUTH 33°36'59" WEST 38.64 feet;
486) SOUTH 35°52'48" WEST 190.85 feet;
487) SOUTH 36°07'34" WEST 68.43 feet;
488) SOUTH 24°55'07" WEST 25.57 feet;
489) SOUTH 33°51'52" WEST 26.12 feet;
490) SOUTH 29°09'16" WEST 25.70 feet;
491) SOUTH 25°01'38" WEST 140.74 feet;
492) SOUTH 11°00'57" WEST 12.96 feet;
493) SOUTH 27°59'49" WEST 12.71 feet;
494) SOUTH 37°23'30" WEST 13.18 feet;
495) SOUTH 20°56'51" WEST 25.24 feet;
496) SOUTH 16°14'49" WEST 24.95 feet;
497) SOUTH 24°09'21" WEST 51.23 feet;
498) SOUTH 13°54'12" WEST 12.72 feet;
499) SOUTH 23°31'52" WEST 89.34 feet;
500) SOUTH 33°37'04" WEST 38.64 feet;
501) SOUTH 25°15'33" WEST 25.24 feet;
502) SOUTH 33°19'34" WEST 51.93 feet;
503) SOUTH 23°23'45" WEST 25.67 feet;
504) SOUTH 40°22'31" WEST 26.05 feet;
505) SOUTH 44°47'47" WEST 38.58 feet;
506) SOUTH 48°50'25" WEST 38.80 feet;
507) SOUTH 58°42'02" WEST 52.34 feet;
508) SOUTH 61°24'51" WEST 26.12 feet;
509) SOUTH 53°20'10" WEST 13.22 feet;
510) SOUTH 63°27'47" WEST 39.09 feet;
511) SOUTH 69°18'07" WEST 78.12 feet;
512) SOUTH 82°44'24" WEST 13.28 feet;
513) SOUTH 72°32'56" WEST 12.91 feet;
514) SOUTH 65°56'27" WEST 39.24 feet;
515) SOUTH 70°16'36" WEST 26.18 feet;
516) SOUTH 65°51'06" WEST 52.14 feet;
517) SOUTH 68°19'01" WEST 51.81 feet;
518) SOUTH 75°40'26" WEST 12.70 feet;
519) SOUTH 65°51'05" WEST 26.07 feet;
520) SOUTH 70°25'51" WEST 51.69 feet;
521) SOUTH 54°05'26" WEST 13.46 feet;
522) SOUTH 68°34'47" WEST 12.61 feet;
523) SOUTH 77°51'29" WEST 13.19 feet;
524) SOUTH 65°07'48" WEST 26.23 feet;

525) SOUTH 53°35'10" WEST 25.99 feet;
526) SOUTH 49°39'13" WEST 38.32 feet;
527) SOUTH 39°22'28" WEST 13.07 feet;
528) SOUTH 49°25'14" WEST 14.37 feet;
529) SOUTH 51°23'56" WEST 10.94 feet;
530) SOUTH 43°25'35" WEST 38.71 feet;
531) SOUTH 33°19'39" WEST 12.98 feet;
532) SOUTH 24°55'17" WEST 12.78 feet;
533) SOUTH 39°22'30" WEST 26.15 feet;
534) SOUTH 30°49'40" WEST 38.34 feet;
535) SOUTH 27°47'05" WEST 64.66 feet;
536) SOUTH 20°40'01" WEST 12.79 feet;
537) SOUTH 14°57'48" WEST 50.74 feet;
538) SOUTH 16°58'36" WEST 141.16 feet;
539) SOUTH 14°12'14" WEST 38.58 feet;
540) SOUTH 07°57'29" WEST 38.91 feet;
541) SOUTH 14°46'50" WEST 13.14 feet;
542) SOUTH 03°10'35" WEST 13.12 feet;
543) SOUTH 26°06'14" WEST 12.91 feet;
544) SOUTH 14°58'39" WEST 25.93 feet;
545) SOUTH 19°46'52" WEST 25.83 feet;
546) SOUTH 29°50'25" WEST 64.66 feet;
547) SOUTH 43°25'39" WEST 38.71 feet;
548) SOUTH 46°40'49" WEST 64.54 feet;
549) SOUTH 53°16'07" WEST 52.21 feet;
550) SOUTH 59°23'08" WEST 25.98 feet;
551) SOUTH 66°50'39" WEST 26.19 feet;
552) SOUTH 85°52'33" WEST 13.20 feet;
553) SOUTH 72°20'56" WEST 25.55 feet;
554) SOUTH 78°43'03" WEST 38.83 feet;
555) SOUTH 81°01'45" WEST 117.97 feet;
556) SOUTH 82°56'44" WEST 79.03 feet;
557) SOUTH 80°11'42" WEST 26.15 feet;
558) SOUTH 89°39'33" WEST 64.89 feet;
559) NORTH 85°22'21" WEST 26.08 feet;
560) SOUTH 87°49'08" WEST 52.08 feet;
561) SOUTH 74°06'08" WEST 12.80 feet;
562) SOUTH 67°17'46" WEST 49.65 feet;
563) SOUTH 62°41'39" WEST 15.55 feet;
564) SOUTH 55°01'40" WEST 65.06 feet;
565) SOUTH 48°00'38" WEST 25.81 feet;
566) SOUTH 55°29'31" WEST 38.60 feet;
567) SOUTH 62°43'28" WEST 13.23 feet;
568) SOUTH 54°56'35" WEST 51.81 feet;

569) SOUTH 51°48'35" WEST 65.64 feet;
570) SOUTH 49°50'50" WEST 20.55 feet;
571) SOUTH 49°50'50" WEST 44.68 feet;
572) SOUTH 46°36'05" WEST 19.11 feet;
573) SOUTH 46°36'05" WEST 71.53 feet;
574) SOUTH 48°43'08" WEST 129.20 feet;
575) SOUTH 45°29'28" WEST 25.69 feet;
576) SOUTH 48°50'44" WEST 38.80 feet;
577) SOUTH 45°52'33" WEST 38.27 feet;
578) SOUTH 47°35'30" WEST 167.53 feet;
579) SOUTH 44°10'47" WEST 51.75 feet;
580) SOUTH 48°00'42" WEST 25.81 feet;
581) SOUTH 45°26'53" WEST 64.68 feet;
582) SOUTH 42°55'09" WEST 51.68 feet;
583) SOUTH 46°58'48" WEST 25.85 feet;
584) SOUTH 41°25'46" WEST 25.49 feet;
585) SOUTH 46°58'48" WEST 25.85 feet;
586) SOUTH 44°29'25" WEST 76.76 feet;
587) SOUTH 47°07'12" WEST 1.99 feet;
588) SOUTH 47°07'12" WEST 23.40 feet;
589) SOUTH 35°37'10" WEST 38.22 feet;
590) SOUTH 20°51'32" WEST 1.45 feet;
591) SOUTH 20°51'32" WEST 36.58 feet;
592) SOUTH 26°06'33" WEST 12.91 feet;
593) SOUTH 36°22'07" WEST 13.01 feet;
594) SOUTH 09°13'31" WEST 25.41 feet;
595) SOUTH 20°32'16" WEST 309.81 feet;
596) SOUTH 16°26'39" WEST 38.60 feet;
597) SOUTH 08°31'01" WEST 51.09 feet;
598) SOUTH 14°12'32" WEST 38.58 feet;
599) SOUTH 20°07'36" WEST 13.13 feet;
600) SOUTH 10°13'06" WEST 77.18 feet;
601) SOUTH 29°09'46" WEST 12.85 feet;
602) SOUTH 22°41'41" WEST 38.90 feet;
603) SOUTH 20°23'47" WEST 103.69 feet;
604) SOUTH 36°18'48" WEST 25.55 feet;
605) SOUTH 32°53'53" WEST 64.59 feet;
606) SOUTH 31°13'49" WEST 64.30 feet;
607) SOUTH 43°26'01" WEST 38.71 feet;
608) SOUTH 46°54'51" WEST 52.16 feet;
609) SOUTH 43°26'03" WEST 25.81 feet;
610) SOUTH 56°51'41" WEST 91.06 feet;
611) SOUTH 60°45'24" WEST 51.91 feet;
612) SOUTH 50°30'25" WEST 13.00 feet;

613) SOUTH 66°18'35" WEST 65.43 feet;
614) SOUTH 63°23'13" WEST 64.43 feet;
615) SOUTH 64°51'34" WEST 77.89 feet;
616) SOUTH 61°39'23" WEST 39.09 feet;
617) SOUTH 72°57'03" WEST 13.19 feet;
618) SOUTH 55°56'31" WEST 12.80 feet;
619) SOUTH 62°19'45" WEST 39.17 feet;
620) SOUTH 73°19'44" WEST 39.18 feet;
621) SOUTH 67°30'58" WEST 34.32 feet;
622) SOUTH 77°51'58" WEST 13.19 feet;
623) SOUTH 59°22'31" WEST 13.33 feet;
624) SOUTH 74°56'29" WEST 52.52 feet;
625) SOUTH 67°46'19" WEST 104.99 feet;
626) SOUTH 61°24'22" WEST 105.16 feet;
627) SOUTH 60°10'32" WEST 145.12 feet;
628) SOUTH 57°21'29" WEST 91.59 feet;
629) SOUTH 49°16'45" WEST 78.26 feet;
630) SOUTH 51°29'01" WEST 104.40 feet;
631) SOUTH 47°59'31" WEST 9.14 feet;
632) SOUTH 48°04'50" WEST 30.15 feet;
633) SOUTH 35°18'46" WEST 12.84 feet;
634) SOUTH 44°49'21" WEST 243.03 feet;
635) SOUTH 44°49'21" WEST 31.19 feet;
636) SOUTH 43°06'49" WEST 17.36 feet;
637) SOUTH 43°06'49" WEST 87.80 feet;
638) SOUTH 45°33'59" WEST 91.04 feet;
639) SOUTH 29°10'03" WEST 12.85 feet;
640) SOUTH 39°29'49" WEST 38.92 feet;
641) SOUTH 39°29'49" WEST 78.93 feet;
642) SOUTH 31°49'10" WEST 25.96 feet;
643) SOUTH 35°47'31" WEST 156.33 feet;
644) SOUTH 37°32'30" WEST 19.38 feet;
645) SOUTH 37°32'30" WEST 58.49 feet;
646) SOUTH 40°52'50" WEST 26.24 feet;
647) SOUTH 45°06'53" WEST 91.35 feet;
648) SOUTH 55°07'32" WEST 39.50 feet;
649) SOUTH 50°37'49" WEST 54.95 feet;
650) SOUTH 50°55'22" WEST 62.69 feet;
651) SOUTH 52°57'50" WEST 52.44 feet;
652) SOUTH 55°38'22" WEST 118.10 feet;
653) SOUTH 58°02'23" WEST 65.57 feet;
654) SOUTH 56°41'43" WEST 78.92 feet;
655) SOUTH 69°32'46" WEST 26.31 feet;
656) SOUTH 62°37'10" WEST 156.60 feet;

657) SOUTH 68°05'00" WEST 13.29 feet;
658) SOUTH 63°10'03" WEST 91.58 feet;
659) SOUTH 55°33'32" WEST 39.29 feet;
660) SOUTH 74°28'40" WEST 13.09 feet;
661) SOUTH 66°15'46" WEST 52.95 feet;
662) SOUTH 71°02'29" WEST 15.33 feet;
663) SOUTH 71°02'29" WEST 10.74 feet;
664) SOUTH 62°53'47" WEST 65.72 feet;
665) SOUTH 60°44'13" WEST 71.92 feet;
666) SOUTH 60°44'13" WEST 59.57 feet;
667) SOUTH 70°17'28" WEST 26.19 feet;
668) SOUTH 59°55'53" WEST 65.61 feet;
669) SOUTH 54°31'19" WEST 65.49 feet;
670) SOUTH 57°09'06" WEST 39.60 feet;
671) SOUTH 60°25'02" WEST 26.05 feet;
672) SOUTH 55°07'41" WEST 39.50 feet;
673) SOUTH 60°44'12" WEST 13.15 feet;
674) SOUTH 66°51'29" WEST 26.19 feet;
675) SOUTH 57°35'37" WEST 39.40 feet;
676) SOUTH 64°25'52" WEST 26.39 feet;
677) SOUTH 60°54'37" WEST 105.02 feet;
678) SOUTH 59°07'25" WEST 65.49 feet;
679) SOUTH 55°48'17" WEST 39.53 feet;
680) SOUTH 44°22'47" WEST 26.21 feet;
681) SOUTH 33°20'41" WEST 12.98 feet;
682) SOUTH 26°42'05" WEST 25.94 feet;
683) SOUTH 17°14'14" WEST 13.30 feet;
684) SOUTH 10°23'39" WEST 25.86 feet;
685) SOUTH 25°39'15" WEST 51.83 feet;
686) SOUTH 20°34'18" WEST 52.29 feet;
687) SOUTH 25°16'37" WEST 143.01 feet;
688) SOUTH 21°36'44" WEST 26.13 feet;
689) SOUTH 14°59'29" WEST 25.93 feet;
690) SOUTH 23°06'07" WEST 13.00 feet;
691) SOUTH 33°53'02" WEST 26.12 feet;
692) SOUTH 26°21'12" WEST 26.27 feet;
693) SOUTH 20°24'21" WEST 25.92 feet;
694) SOUTH 38°23'28" WEST 78.29 feet;
695) SOUTH 45°37'19" WEST 52.51 feet;
696) SOUTH 57°42'07" WEST 26.12 feet;
697) SOUTH 60°56'59" WEST 39.70 feet;
698) SOUTH 78°38'48" WEST 26.30 feet;
699) SOUTH 72°57'35" WEST 13.19 feet;
700) SOUTH 61°56'31" WEST 65.98 feet;

701) SOUTH 58°22'57" WEST 52.54 feet;
702) SOUTH 56°01'25" WEST 90.34 feet;
703) SOUTH 56°01'25" WEST 41.07 feet;
704) SOUTH 49°12'46" WEST 130.98 feet;
705) SOUTH 54°12'08" WEST 39.24 feet;
706) SOUTH 46°45'36" WEST 125.56 feet;
707) SOUTH 46°45'36" WEST 189.12 feet;
708) SOUTH 51°45'20" WEST 77.73 feet;
709) SOUTH 57°46'43" WEST 65.77 feet;
710) SOUTH 60°44'31" WEST 26.30 feet;
711) SOUTH 57°23'16" WEST 33.21 feet;
712) SOUTH 58°05'55" WEST 85.30 feet;
713) SOUTH 56°01'32" WEST 78.85 feet;
714) SOUTH 63°35'12" WEST 52.84 feet;
715) SOUTH 66°37'42" WEST 52.80 feet;
716) SOUTH 70°30'57" WEST 26.46 feet;
717) SOUTH 74°28'55" WEST 26.17 feet;
718) SOUTH 15°37'06" WEST 26.01 feet;
719) SOUTH 10°53'29" WEST 26.27 feet;
720) SOUTH 01°36'29" WEST 51.71 feet;
721) SOUTH 06°18'11" WEST 65.13 feet;
722) SOUTH 11°02'06" WEST 25.91 feet;
723) SOUTH 21°00'52" WEST 26.02 feet;
724) SOUTH 30°51'59" WEST 52.25 feet;
725) SOUTH 42°12'02" WEST 65.21 feet;
726) SOUTH 13°14'55" WEST 91.04 feet;
727) SOUTH 22°12'42" WEST 26.23 feet;
728) SOUTH 34°46'39" WEST 65.11 feet;
729) SOUTH 40°53'21" WEST 26.24 feet;
730) SOUTH 46°25'06" WEST 26.10 feet;
731) SOUTH 51°15'31" WEST 65.43 feet;
732) SOUTH 62°44'28" WEST 13.23 feet;
733) NORTH 89°21'45" WEST 26.60 feet;
734) SOUTH 82°34'50" WEST 12.99 feet;
735) SOUTH 74°49'49" WEST 13.37 feet;
736) SOUTH 64°49'07" WEST 37.91 feet;
737) NORTH 43°11'05" WEST 16.72 feet;
738) SOUTH 63°35'42" WEST 192.69 feet to a point, having grid coordinates of N 1,797,034.90, E 6,257,341.54, said point being SOUTH 43°11'05" EAST 3017.27 feet from NGS Monument "S 149" (PID GU2177), being a 3-inch brass disc, punched and stamped "S 149 1933", having grid coordinates of N 1,799,234.95, E 6,255,276.66;

739) NORTH 33°54'44" WEST 255.46 feet;
740) NORTH 36°35'55" WEST 348.15 feet;

741) **NORTH 62°58'57" WEST 399.02 feet;**
742) **SOUTH 87°44'58" WEST 188.85 feet;**
743) **NORTH 41°11'54" WEST 937.07 feet;**
744) **NORTH 57°17'59" WEST 441.08 feet;**
745) **NORTH 19°41'25" WEST 296.50 feet** to a point, having grid coordinates of **N 1,798,922.80, E 6,255,358.97,** said point being **SOUTH 14°46'19" EAST 322.82 feet** from NGS Monument "S 149" (PID GU2177), being a 3-inch brass disc, punched and stamped "S 149 1933", having grid coordinates of **N 1,799,234.95, E 6,255,276.66;**

746) **NORTH 31°43'40" WEST 901.34 feet;**
747) **NORTH 48°42'45" WEST 547.18 feet;**
748) **NORTH 23°55'07" WEST 1794.93 feet;**
749) **NORTH 38°53'43" WEST 169.57 feet;**
750) **NORTH 04°07'11" EAST 307.74 feet;**
751) **NORTH 21°37'09" WEST 126.33 feet;**
752) **NORTH 02°10'57" EAST 3190.64 feet;**
753) **NORTH 48°53'11" EAST 126.51 feet;**
754) **NORTH 21°49'59" EAST 298.44 feet;**
755) **NORTH 05°13'13" WEST 420.75 feet;**
756) **NORTH 29°34'54" EAST 366.71 feet;**
757) **NORTH 79°27'50" EAST 84.05 feet;**
758) **NORTH 57°40'00" EAST 243.15 feet;**
759) **NORTH 17°39'29" EAST 345.11 feet;**
760) **NORTH 00°57'03" WEST 1362.14 feet;**
761) **NORTH 45°58'37" EAST 197.36 feet;**
762) **NORTH 08°45'06" EAST 228.14 feet;**
763) **NORTH 12°50'02" WEST 447.27 feet;**
764) **NORTH 49°15'33" EAST 222.52 feet;**
765) **NORTH 12°52'54" EAST 187.19 feet;**
766) **NORTH 03°41'39" WEST 559.94 feet;**
767) **NORTH 19°46'00" WEST 181.66 feet** to a point, having grid coordinates of **N 1,810,226.49, E 6,254,646.00,** said point being **SOUTH 40°10'44" WEST 3709.50 feet** from NGS Monument "R 149" (PID GU2188), being a 3-inch brass disc, punched and stamped "R 149 1933", having grid coordinates of **N 1,813,060.68, E 6,257,039.28;**

768) **NORTH 57°51'27" WEST 667.79 feet;**
769) **SOUTH 81°28'27" WEST 177.99 feet;**
770) **NORTH 41°55'57" WEST 513.02 feet;**
771) **NORTH 58°54'00" WEST 179.07 feet;**
772) **NORTH 74°44'14" WEST 759.93 feet;**
773) **NORTH 57°48'37" WEST 330.32 feet;**
774) **SOUTH 89°34'04" WEST 813.17 feet;**
775) **NORTH 79°17'07" WEST 518.40 feet;**
776) **NORTH 29°36'29" WEST 1828.17 feet;**

777) NORTH 43°32'57” WEST 304.82 feet;
778) NORTH 64°34'13” WEST 171.48 feet;
779) NORTH 32°42'12” WEST 656.28 feet;
780) NORTH 49°50'05” WEST 193.28 feet;
781) NORTH 86°32'12” WEST 274.16 feet;
782) NORTH 24°12'24” EAST 162.36 feet;
783) NORTH 05°10'33” WEST 170.11 feet;
784) NORTH 31°51'09” WEST 132.20 feet;
785) NORTH 08°59'38” EAST 115.67 feet;
786) NORTH 12°18'19” WEST 153.14 feet;
787) NORTH 46°03'35” WEST 226.95 feet;
788) NORTH 32°30'52” EAST 163.93 feet;
789) NORTH 01°45'33” EAST 183.81 feet;
790) NORTH 31°30'48” WEST 704.20 feet;
791) NORTH 60°08'54” WEST 1065.52 feet;
792) NORTH 60°38'29” WEST 176.94 feet;
793) NORTH 30°34'08” WEST 1017.52 feet;
794) NORTH 01°23'47” WEST 460.21 feet;
795) NORTH 20°49'18” WEST 462.72 feet;
796) NORTH 23°08'06” WEST 442.17 feet;
797) NORTH 41°15'31” WEST 204.11 feet to a point, having grid coordinates of N 1,818,792.61, E 6,246,478.43, said point being SOUTH 37°43’34” WEST 3072.63 feet from SCVWD Benchmark “BM021”, being a 2-inch brass disc, punched and stamped “BM 021”, having grid coordinates of N 1,821,222.90, E 6,248,358.53;

798) NORTH 74°40'25” WEST 648.52 feet;
799) SOUTH 72°47'22” WEST 505.59 feet;
800) SOUTH 89°04'21” WEST 277.22 feet;
801) SOUTH 55°18'59” WEST 178.61 feet;
802) SOUTH 39°29'43” WEST 440.23 feet;
803) NORTH 60°31'56” WEST 130.39 feet;
804) NORTH 16°11'22” EAST 296.03 feet;
805) NORTH 03°40'28” WEST 513.01 feet;
806) NORTH 12°32'51” WEST 312.26 feet;
807) NORTH 28°07'30” EAST 64.32 feet;
808) NORTH 11°35'27” EAST 151.35 feet;
809) NORTH 19°13'09” WEST 361.54 feet;
810) NORTH 41°08'58” WEST 209.83 feet;
811) NORTH 66°37'21” WEST 289.06 feet;
812) SOUTH 75°00'00” WEST 210.92 feet;
813) SOUTH 35°39'26” WEST 230.79 feet;
814) SOUTH 11°43'04” WEST 193.14 feet;
815) NORTH 79°16'41” WEST 366.23 feet;
816) NORTH 41°15'00” EAST 128.01 feet;

817) SOUTH 87°38'47" EAST 50.38 feet;
818) NORTH 60°00'00" EAST 128.01 feet;
819) NORTH 30°00'00" EAST 210.92 feet;
820) NORTH 05°37'30" WEST 190.47 feet;
821) NORTH 37°12'02" WEST 520.84 feet;
822) NORTH 65°39'29" WEST 364.01 feet;
823) SOUTH 76°52'30" WEST 149.00 feet;
824) SOUTH 38°09'32" WEST 198.12 feet;
825) SOUTH 54°22'30" WEST 231.13 feet;
826) NORTH 52°39'25" WEST 416.95 feet;
827) NORTH 59°59'22" WEST 397.97 feet;
828) NORTH 85°32'16" WEST 169.71 feet;
829) NORTH 53°10'45" WEST 260.51 feet;
830) NORTH 72°11'11" WEST 81.30 feet;
831) NORTH 30°02'55" EAST 498.11 feet;
832) NORTH 13°22'58" EAST 188.18 feet;
833) NORTH 14°50'40" WEST 455.07 feet;
834) NORTH 46°58'20" WEST 500.06 feet;
835) NORTH 68°44'27" WEST 315.32 feet;
836) NORTH 44°26'39" WEST 291.91 feet;
837) NORTH 79°47'39" WEST 212.66 feet;
838) SOUTH 63°21'16" WEST 338.35 feet;
839) SOUTH 40°21'58" WEST 109.54 feet;
840) NORTH 30°29'45" WEST 166.71 feet;
841) NORTH 45°08'16" WEST 165.86 feet;
842) NORTH 71°38'40" WEST 160.55 feet;
843) NORTH 06°54'03" WEST 174.91 feet;
844) NORTH 23°04'27" WEST 146.55 feet;
845) NORTH 49°54'57" WEST 477.18 feet;
846) NORTH 64°45'04" WEST 165.51 feet;
847) NORTH 26°14'40" WEST 281.92 feet;
848) NORTH 19°13'10" EAST 169.01 feet;
849) NORTH 17°41'15" WEST 245.57 feet;
850) NORTH 54°54'35" WEST 489.18 feet;
851) NORTH 89°31'12" WEST 797.35 feet;
852) SOUTH 53°12'56" WEST 240.69 feet;
853) SOUTH 13°54'24" WEST 409.28 feet;
854) SOUTH 68°27'32" WEST 320.65 feet;
855) NORTH 18°30'35" WEST 362.78 feet;
856) NORTH 43°18'33" WEST 513.93 feet;
857) NORTH 62°15'38" WEST 71.25 feet;
858) SOUTH 89°57'35" WEST 935.61 feet;
859) NORTH 68°37'27" WEST 144.50 feet;
860) NORTH 18°26'08" EAST 379.94 feet;

861) NORTH 20°19'37" WEST 529.60 feet;
862) NORTH 62°02'05" WEST 429.08 feet;
863) NORTH 86°32'15" WEST 267.13 feet;
864) SOUTH 75°32'41" WEST 202.27 feet;
865) NORTH 46°10'56" WEST 417.30 feet;
866) SOUTH 86°46'20" WEST 367.96 feet;
867) SOUTH 52°30'00" WEST 169.83 feet;
868) NORTH 74°35'50" WEST 259.23 feet;
869) NORTH 84°18'14" WEST 487.97 feet;
870) SOUTH 64°45'17" WEST 822.53 feet;
871) SOUTH 38°40'15" WEST 219.65 feet;
872) NORTH 57°44'23" WEST 497.37 feet;
873) NORTH 75°48'07" WEST 358.34 feet;
874) NORTH 53°46'41" WEST 354.45 feet;
875) NORTH 85°56'15" WEST 275.00 feet;
876) SOUTH 78°46'48" WEST 150.06 feet;
877) SOUTH 49°47'00" WEST 543.10 feet;
878) SOUTH 20°56'49" WEST 178.67 feet;
879) NORTH 80°05'14" WEST 76.08 feet;
880) NORTH 29°14'33" WEST 110.11 feet;
881) NORTH 51°12'28" WEST 200.82 feet;
882) NORTH 27°02'52" EAST 35.05 feet;
883) NORTH 59°30'52" EAST 238.11 feet;
884) NORTH 35°03'24" EAST 146.67 feet;
885) NORTH 56°16'25" EAST 136.51 feet;
886) NORTH 27°31'21" EAST 75.55 feet;
887) NORTH 46°06'42" EAST 41.62 feet;
888) NORTH 15°22'08" EAST 254.47 feet;
889) NORTH 44°27'31" WEST 377.61 feet to a point, having grid coordinate of N 1,827,016.26, E 6,230,407.33, said point being SOUTH 54°11'25" EAST 5608.64 feet from NGS Monument "U 1458" (PID HS5284), being a steel rod inside a monument well, punched and stamped "U 1458 1990", having grid coordinates of N 1,830,297.86, E 6,225,858.93;

890) NORTH 06°06'27" EAST 95.79 feet;
891) NORTH 16°38'13" EAST 213.43 feet;
892) NORTH 42°30'49" EAST 85.84 feet;
893) NORTH 24°46'38" EAST 113.24 feet;
894) NORTH 15°18'44" EAST 196.06 feet;
895) NORTH 37°25'13" EAST 257.53 feet;
896) NORTH 02°21'57" EAST 699.86 feet;
897) NORTH 46°08'11" WEST 67.13 feet;
898) NORTH 57°12'08" EAST 74.35 feet;
899) NORTH 42°42'58" EAST 435.59 feet;

900) NORTH 24°31'09" EAST 126.00 feet;
901) SOUTH 59°37'17" EAST 63.56 feet;
902) NORTH 30°22'45" EAST 18.58 feet;
903) NORTH 16°03'28" WEST 29.42 feet;
904) NORTH 61°06'07" WEST 205.19 feet;
905) NORTH 66°12'49" WEST 241.99 feet;
906) NORTH 76°43'08" WEST 241.04 feet;
907) NORTH 08°11'13" EAST 37.23 feet;
908) SOUTH 88°16'12" EAST 1407.24 feet;
909) SOUTH 26°59'25" WEST 140.05 feet;
910) SOUTH 63°00'35" EAST 106.43 feet;
911) SOUTH 53°15'52" EAST 42.87 feet;
912) SOUTH 67°18'52" EAST 237.75 feet;
913) SOUTH 11°16'20" WEST 16.11 feet;
914) SOUTH 26°49'42" EAST 363.82 feet;
915) SOUTH 40°11'12" EAST 31.43 feet;
916) SOUTH 81°02'09" EAST 18.46 feet;
917) SOUTH 88°26'09" EAST 68.20 feet to a point, having grid coordinate of **N 1,828,695.48, E 6,232,568.20,** said point being **SOUTH 76°34'04" EAST 6897.97 feet** from said NGS Monument "U 1458" (PID HS5284), having grid coordinates of **N 1,830,297.86, E 6,225,858.93;**

918) SOUTH 44°08'15" EAST 376.92 feet;
919) SOUTH 87°54'22" EAST 68.34 feet;
920) NORTH 86°08'57" EAST 245.26 feet;
921) NORTH 86°08'36" EAST 701.88 feet;
922) NORTH 84°00'43" EAST 423.17 feet;
923) NORTH 55°20'09" EAST 327.90 feet;
924) NORTH 28°19'08" EAST 278.17 feet;
925) NORTH 00°00'02" EAST 261.94 feet;
926) NORTH 22°27'12" WEST 268.34 feet;
927) SOUTH 85°20'32" EAST 323.76 feet;
928) SOUTH 58°07'02" EAST 242.36 feet;
929) SOUTH 79°23'31" EAST 139.17 feet;
930) SOUTH 07°57'44" WEST 323.66 feet;
931) SOUTH 24°28'52" EAST 305.60 feet;
932) SOUTH 55°37'43" EAST 298.10 feet;
933) SOUTH 88°03'17" EAST 1696.26 feet;
934) NORTH 74°20'36" EAST 205.24 feet;
935) SOUTH 77°56'42" EAST 506.78 feet;
936) NORTH 89°27'56" EAST 1045.60 feet;
937) NORTH 68°13'10" EAST 342.68 feet;
938) NORTH 40°22'10" EAST 271.03 feet;
939) NORTH 65°35'24" EAST 94.51 feet;

940) SOUTH 75°12'44" EAST 363.85 feet;
941) NORTH 70°18'34" EAST 208.13 feet;
942) NORTH 30°13'30" EAST 713.23 feet;
943) NORTH 11°20'54" WEST 243.77 feet;
944) NORTH 38°12'03" WEST 433.47 feet;
945) NORTH 82°13'26" WEST 242.28 feet;
946) NORTH 01°13'29" WEST 97.13 feet;
947) NORTH 24°22'21" EAST 279.80 feet;
948) NORTH 03°12'48" EAST 236.61 feet;
949) NORTH 57°59'46" EAST 312.04 feet;
950) NORTH 22°19'00" EAST 286.52 feet;
951) NORTH 21°46'54" WEST 555.04 feet to a point, having grid coordinate of N 1,831,539.16, E 6,240,215.85, said point being SOUTH 72°00'14" WEST 7092.93 feet from NGS Monument "Q 1448" (PID HS5172), being a steel rod inside a monument well lid punched and stamped "Q 1448 1988", having grid coordinates of N 1,833,730.55, E 6,246,961.77;

952) NORTH 71°30'41" WEST 564.72 feet;
953) NORTH 61°40'20" WEST 476.74 feet;
954) SOUTH 86°22'12" WEST 272.36 feet;
955) NORTH 63°07'08" WEST 339.75 feet;
956) SOUTH 88°36'37" WEST 535.96 feet;
957) NORTH 14°46'06" WEST 156.50 feet;
958) NORTH 42°41'00" WEST 345.16 feet;
959) NORTH 12°45'14" WEST 139.10 feet;
960) NORTH 40°54'30" WEST 210.15 feet;
961) NORTH 05°21'03" WEST 222.23 feet;
962) NORTH 48°28'31" WEST 304.44 feet;
963) NORTH 12°57'29" WEST 260.65 feet;
964) NORTH 66°38'59" EAST 207.91 feet;
965) NORTH 59°15'20" EAST 342.56 feet;
966) NORTH 25°55'14" EAST 157.58 feet;
967) NORTH 12°01'29" EAST 300.20 feet;
968) NORTH 04°16'08" EAST 295.70 feet;
969) NORTH 27°28'56" WEST 256.08 feet;
970) NORTH 38°57'22" WEST 289.55 feet;
971) NORTH 75°58'46" WEST 170.98 feet;
972) SOUTH 66°41'16" WEST 108.18 feet;
973) NORTH 01°56'25" WEST 299.33 feet;
974) NORTH 20°10'39" EAST 191.01 feet;
975) NORTH 11°44'13" WEST 442.95 feet to a point, having grid coordinate of N 1,835,795.32, E 6,237,439.59, said point being NORTH 69°29'36" WEST 3834.14 feet from NGS Monument "G 812 RESET" (PID AC9287), being a 3.5-inch brass disc,

punched and stamped "G 812 RESET 1993", having grid coordinates of N 1,834,452.17, E 6,241,030.77;

976) NORTH 40°58'45" WEST 523.16 feet;
977) NORTH 51°06'54" WEST 538.67 feet;
978) NORTH 68°46'23" WEST 390.87 feet;
979) NORTH 33°02'55" WEST 223.05 feet;
980) NORTH 00°04'08" WEST 1018.37 feet;
981) NORTH 00°13'27" WEST 816.07 feet;
982) NORTH 50°27'30" EAST 759.26 feet;
983) NORTH 62°44'59" EAST 434.56 feet;
984) SOUTH 83°43'38" EAST 473.55 feet;
985) SOUTH 59°45'35" EAST 456.55 feet;
986) SOUTH 88°44'28" EAST 289.39 feet;
987) NORTH 54°56'58" EAST 251.40 feet;
988) NORTH 22°04'51" EAST 1278.30 feet;
989) NORTH 06°08'48" WEST 567.50 feet to a point, having grid coordinate of N 1,840,978.84, E 6,238,938.67, said point being SOUTH 69°51'32" WEST 4790.64 feet from NGS Monument "M 149" (PID HS2736), being a 2.5-inch brass disc, punched and stamped "M149 1993", having grid coordinates of N 1,842,628.42, E 6,243,436.35;

990) NORTH 55°40'39" WEST 574.00 feet;
991) NORTH 71°03'20" WEST 552.40 feet;
992) NORTH 54°35'22" WEST 1184.35 feet;
993) NORTH 27°50'48" WEST 147.34 feet;
994) NORTH 01°03'04" EAST 120.74 feet;
995) NORTH 07°30'50" WEST 1024.64 feet;
996) NORTH 27°25'18" WEST 296.56 feet;
997) NORTH 08°45'46" WEST 201.85 feet;
998) NORTH 32°23'58" WEST 650.63 feet;
999) NORTH 16°28'17" WEST 318.21 feet;
1000) NORTH 37°31'57" WEST 815.22 feet;
1001) NORTH 51°40'46" EAST 304.64 feet;
1002) NORTH 14°15'08" EAST 185.61 feet;
1003) NORTH 02°10'45" WEST 138.04 feet;
1004) NORTH 35°26'00" EAST 231.73 feet;
1005) NORTH 03°33'37" EAST 329.35 feet;
1006) NORTH 32°22'19" WEST 356.98 feet;
1007) NORTH 74°34'45" WEST 372.67 feet;
1008) SOUTH 75°31'17" WEST 316.74 feet;
1009) SOUTH 40°08'16" WEST 308.67 feet;
1010) SOUTH 76°26'40" WEST 183.04 feet;
1011) NORTH 66°50'36" WEST 278.24 feet;
1012) NORTH 49°51'37" WEST 161.64 feet;

1013) NORTH 28°59'36" WEST 299.28 feet;
1014) NORTH 48°27'31" WEST 344.66 feet;
1015) NORTH 13°50'41" WEST 352.11 feet;
1016) NORTH 35°01'43" WEST 549.61 feet;
1017) NORTH 56°50'41" WEST 245.94 feet;
1018) NORTH 38°34'28" WEST 299.20 feet;
1019) NORTH 73°04'52" WEST 360.78 feet;
1020) NORTH 13°10'17" EAST 527.92 feet;
1021) SOUTH 74°13'30" EAST 521.27 feet;
1022) NORTH 73°29'19" EAST 434.45 feet;
1023) SOUTH 80°48'50" EAST 264.36 feet;
1024) NORTH 64°35'17" EAST 606.20 feet;
1025) NORTH 23°38'54" EAST 402.76 feet to a point, having grid coordinate of N 1,849,517.38, E 6,234,962.47, said point being SOUTH 78°16'52" WEST 5185.87 feet from NGS Monument "G 1080" (PID HS2738), being a 3-inch brass disc, punched and stamped "G 1080 1967", having grid coordinates of N 1,850,570.69, E 6,240,040.24;

1026) NORTH 13°44'46" WEST 555.74 feet;
1027) NORTH 40°45'50" WEST 638.23 feet;
1028) NORTH 00°02'51" WEST 127.57 feet;
1029) NORTH 20°04'44" WEST 248.48 feet;
1030) NORTH 28°55'49" EAST 651.26 feet;
1031) NORTH 14°44'33" EAST 160.82 feet;
1032) NORTH 16°16'30" WEST 834.13 feet;
1033) NORTH 54°57'18" WEST 569.63 feet;
1034) NORTH 01°10'13" EAST 144.61 feet;
1035) NORTH 28°43'22" WEST 731.41 feet;
1036) NORTH 62°51'28" WEST 451.87 feet;
1037) NORTH 42°28'12" WEST 188.34 feet;
1038) NORTH 66°54'40" WEST 161.33 feet;
1039) NORTH 33°34'28" WEST 133.33 feet;
1040) NORTH 24°53'01" EAST 528.30 feet;
1041) NORTH 00°00'36" WEST 216.86 feet;
1042) NORTH 25°51'08" EAST 169.57 feet;
1043) NORTH 05°38'15" EAST 226.73 feet;
1044) NORTH 16°26'49" WEST 269.40 feet;
1045) NORTH 43°12'33" WEST 325.43 feet;
1046) NORTH 07°34'41" EAST 545.08 feet;
1047) NORTH 07°52'50" WEST 369.07 feet;
1048) NORTH 31°55'51" WEST 113.84 feet;
1049) NORTH 86°33'33" EAST 378.71 feet;
1050) NORTH 65°39'59" EAST 221.97 feet;
1051) NORTH 32°39'04" EAST 303.95 feet;
1052) NORTH 67°05'00" EAST 391.98 feet;

1013) NORTH 28°59'36" WEST 299.28 feet;
1014) NORTH 48°27'31" WEST 344.66 feet;
1015) NORTH 13°50'41" WEST 352.11 feet;
1016) NORTH 35°01'43" WEST 549.61 feet;
1017) NORTH 56°50'41" WEST 245.94 feet;
1018) NORTH 38°34'28" WEST 299.20 feet;
1019) NORTH 73°04'52" WEST 360.78 feet;
1020) NORTH 13°10'17" EAST 527.92 feet;
1021) SOUTH 74°13'30" EAST 521.27 feet;
1022) NORTH 73°29'19" EAST 434.45 feet;
1023) SOUTH 80°48'50" EAST 264.36 feet;
1024) NORTH 64°35'17" EAST 606.20 feet;
1025) NORTH 23°38'54" EAST 402.76 feet to a point, having grid coordinate of N 1,849,517.38, E 6,234,962.47, said point being SOUTH 78°16'52" WEST 5185.87 feet from NGS Monument "G 1080" (PID HS2738), being a 3-inch brass disc, punched and stamped "G 1080 1967", having grid coordinates of N 1,850,570.69, E 6,240,040.24;

1026) NORTH 13°44'46" WEST 555.74 feet;
1027) NORTH 40°45'50" WEST 638.23 feet;
1028) NORTH 00°02'51" WEST 127.57 feet;
1029) NORTH 20°04'44" WEST 248.48 feet;
1030) NORTH 28°55'49" EAST 651.26 feet;
1031) NORTH 14°44'33" EAST 160.82 feet;
1032) NORTH 16°16'30" WEST 834.13 feet;
1033) NORTH 54°57'18" WEST 569.63 feet;
1034) NORTH 01°10'13" EAST 144.61 feet;
1035) NORTH 28°43'22" WEST 731.41 feet;
1036) NORTH 62°51'28" WEST 451.87 feet;
1037) NORTH 42°28'12" WEST 188.34 feet;
1038) NORTH 66°54'40" WEST 161.33 feet;
1039) NORTH 33°34'28" WEST 133.33 feet;
1040) NORTH 24°53'01" EAST 528.30 feet;
1041) NORTH 00°00'36" WEST 216.86 feet;
1042) NORTH 25°51'08" EAST 169.57 feet;
1043) NORTH 05°38'15" EAST 226.73 feet;
1044) NORTH 16°26'49" WEST 269.40 feet;
1045) NORTH 43°12'33" WEST 325.43 feet;
1046) NORTH 07°34'41" EAST 545.08 feet;
1047) NORTH 07°52'50" WEST 369.07 feet;
1048) NORTH 31°55'51" WEST 113.84 feet;
1049) NORTH 86°33'33" EAST 378.71 feet;
1050) NORTH 65°39'59" EAST 221.97 feet;
1051) NORTH 32°39'04" EAST 303.95 feet;
1052) NORTH 67°05'00" EAST 391.98 feet;

1053) NORTH 46°55'01" EAST 603.58 feet;
1054) NORTH 27°49'43" EAST 400.50 feet;
1055) NORTH 71°58'27" EAST 507.51 feet;
1056) SOUTH 81°10'10" EAST 675.44 feet;
1057) NORTH 77°44'53" EAST 450.85 feet;
1058) SOUTH 58°33'10" EAST 62.28 feet;
1059) SOUTH 27°07'57" EAST 537.80 feet;
1060) SOUTH 48°55'12" EAST 243.55 feet;
1061) NORTH 77°01'09" EAST 350.37 feet;
1062) NORTH 22°29'33" EAST 378.45 feet;
1063) NORTH 20°17'07" WEST 541.63 feet;
1064) NORTH 47°47'34" EAST 256.63 feet;
1065) NORTH 04°38'01" EAST 435.81 feet;
1066) NORTH 26°43'46" WEST 401.02 feet;
1067) NORTH 65°43'12" WEST 521.01 feet;
1068) SOUTH 89°31'54" WEST 1574.86 feet;
1069) SOUTH 70°04'16" WEST 841.80 feet;
1070) NORTH 88°24'56" WEST 665.36 feet;
1071) SOUTH 73°07'58" WEST 207.68 feet;
1072) SOUTH 54°40'53" WEST 310.44 feet;
1073) NORTH 78°46'33" WEST 146.05 feet;
1074) SOUTH 84°25'48" WEST 189.59 feet;
1075) SOUTH 67°38'09" WEST 429.19 feet;
1076) SOUTH 88°04'05" WEST 376.89 feet;
1077) SOUTH 73°56'55" WEST 160.07 feet;
1078) SOUTH 45°30'46" WEST 1047.86 feet;
1079) SOUTH 12°44'29" WEST 449.77 feet;
1080) SOUTH 02°56'05" EAST 147.90 feet;
1081) SOUTH 33°43'14" EAST 320.68 feet;
1082) SOUTH 56°13'02" EAST 109.98 feet;
1083) SOUTH 71°44'08" WEST 270.30 feet;
1084) NORTH 24°21'42" WEST 124.19 feet;
1085) NORTH 47°14'02" WEST 419.66 feet;
1086) NORTH 65°19'49" WEST 191.11 feet;
1087) SOUTH 85°24'20" WEST 503.24 feet;
1088) NORTH 76°22'24" WEST 431.18 feet;
1089) NORTH 62°57'40" WEST 502.44 feet;
1090) SOUTH 88°41'12" WEST 1254.06 feet;
1091) SOUTH 68°07'32" WEST 142.13 feet;
1092) SOUTH 55°59'17" WEST 328.58 feet;
1093) NORTH 37°8'48" WEST 150.34 feet;
1094) NORTH 56°59'29" WEST 447.36 feet to a point, having grid coordinate of N 1,857,916.31, E 6,226,944.54, said point being **NORTH 28°32'12" EAST 3695.65 feet**

from NGS Monument "M 355" (PID HS5356), being a 3/4-inch iron pipe with a yellow plastic plug, having grid coordinates of N 1,854,669.64, E 6,225,179.04;

1095) NORTH 00°12'51" WEST 212.58 feet;
1096) NORTH 09°21'29" EAST 109.52 feet;
1097) NORTH 27°50'08" EAST 111.56 feet;
1098) SOUTH 74°12'34" EAST 8.86 feet;
1099) NORTH 32°39'33" EAST 173.37 feet;
1100) SOUTH 79°08'29" EAST 31.90 feet;
1101) NORTH 32°24'42" EAST 116.05 feet;
1102) NORTH 33°01'59" WEST 65.96 feet;
1103) NORTH 32°24'45" EAST 120.27 feet;
1104) SOUTH 87°22'16" EAST 43.33 feet;
1105) NORTH 80°46'45" EAST 47.72 feet;
1106) NORTH 11°42'39" EAST 63.31 feet;
1107) NORTH 02°27'43" WEST 69.83 feet;
1108) NORTH 75°29'02" WEST 61.52 feet;
1109) NORTH 81°47'29" WEST 36.59 feet;
1110) NORTH 28°33'42" WEST 494.76 feet;
1111) NORTH 05°52'56" WEST 177.63 feet;
1112) NORTH 84°12'44" WEST 82.96 feet;
1113) NORTH 28°33'44" WEST 228.37 feet;
1114) NORTH 37°57'18" EAST 30.45 feet;
1115) NORTH 11°52'19" EAST 70.17 feet;
1116) NORTH 39°54'23" WEST 75.64 feet;
1117) NORTH 24°25'16" WEST 24.64 feet;
1118) NORTH 39°48'22" WEST 49.11 feet;
1119) NORTH 79°24'23" WEST 9.84 feet;
1120) NORTH 28°53'17" WEST 89.54 feet;
1121) NORTH 13°51'35" EAST 11.78 feet;
1122) NORTH 41°34'38" WEST 84.74 feet;
1123) NORTH 47°39'04" WEST 36.09 feet;
1124) NORTH 28°43'47" EAST 8.95 feet;
1125) NORTH 15°34'22" WEST 65.40 feet;
1126) NORTH 28°00'49" WEST 66.96 feet;
1127) NORTH 77°44'25" WEST 7.43 feet;
1128) NORTH 25°02'30" WEST 93.45 feet;
1129) NORTH 16°43'04" EAST 24.45 feet;
1130) NORTH 49°27'20" WEST 82.06 feet;
1131) SOUTH 24°55'42" WEST 58.74 feet;
1132) SOUTH 63°05'58" WEST 11.00 feet;
1133) SOUTH 26°54'05" EAST 22.22 feet;
1134) SOUTH 51°16'15" WEST 413.55 feet;
1135) NORTH 39°26'11" WEST 400.94 feet;

1136) NORTH 19°03'58" EAST 336.02 feet;
1137) NORTH 36°34'48" EAST 357.02 feet;
1138) NORTH 06°07'14" WEST 518.21 feet;
1139) NORTH 31°12'37" WEST 130.18 feet;
1140) NORTH 59°47'34" WEST 716.68 feet;
1141) NORTH 39°00'00" EAST 652.46 feet;
1142) SOUTH 14°14'10" EAST 8.42 feet;
1143) NORTH 75°45'52" EAST 29.97 feet;
1144) NORTH 01°15'28" EAST 23.35 feet;
1145) NORTH 75°44'22" EAST 23.78 feet;
1146) NORTH 14°15'37" WEST 30.72 feet;
1147) NORTH 38°59'59" EAST 105.52 feet;
1148) NORTH 51°59'08" WEST 421.97 feet;
1149) NORTH 76°00'28" WEST 5.59 feet;
1150) NORTH 46°33'37" EAST 2.81 feet;
1151) NORTH 46°37'43" EAST 553.19 feet;
1152) SOUTH 43°51'45" EAST 45.71 feet;
1153) NORTH 46°59'13" EAST 60.00 feet;
1154) NORTH 43°52'19" WEST 46.08 feet;
1155) NORTH 46°52'34" EAST 1493.85 feet;
1156) NORTH 24°05'25" WEST 635.06 feet;
1157) NORTH 56°34'09" EAST 65.87 feet;
1158) NORTH 24°05'12" WEST 101.79 feet;
1159) NORTH 56°33'44" EAST 55.12 feet;
1160) NORTH 33°26'16" WEST 18.45 feet;
1161) SOUTH 88°38'30" WEST 61.49 feet;
1162) SOUTH 29°35'48" WEST 40.34 feet;
1163) NORTH 49°31'45" WEST 694.02 feet;
1164) NORTH 45°01'07" WEST 36.34 feet;
1165) NORTH 53°39'58" WEST 41.98 feet;
1166) NORTH 23°39'04" WEST 384.29 feet;
1167) NORTH 15°09'33" EAST 49.27 feet;
1168) NORTH 04°58'45" EAST 17.81 feet;
1169) NORTH 52°59'24" WEST 30.85 feet;
1170) NORTH 63°01'13" WEST 38.30 feet;
1171) NORTH 23°39'08" WEST 14.35 feet;
1172) NORTH 17°34'19" EAST 41.73 feet;
1173) NORTH 23°39'09" WEST 67.69 feet;
1174) NORTH 81°31'20" WEST 32.47 feet;
1175) NORTH 23°39'01" WEST 42.96 feet;
1176) NORTH 29°43'57" EAST 15.50 feet;
1177) NORTH 44°08'28" EAST 29.45 feet;
1178) NORTH 21°17'57" EAST 31.86 feet;
1179) NORTH 23°45'37" WEST 14.46 feet;

1180) SOUTH 66°14'23" WEST 37.51 feet;
1181) NORTH 08°14'14" EAST 950.78 feet;
1182) NORTH 26°16'25" EAST 549.43 feet;
1183) NORTH 02°56'07" WEST 313.41 feet;
1184) NORTH 27°11'56" WEST 224.87 feet;
1185) NORTH 65°33'39" WEST 521.94 feet;
1186) SOUTH 66°32'04" WEST 325.21 feet;
1187) NORTH 66°37'24" WEST 312.44 feet;
1188) SOUTH 65°26'07" WEST 244.06 feet;
1189) SOUTH 30°47'24" WEST 385.64 feet;
1190) SOUTH 76°57'24" WEST 341.46 feet;
1191) SOUTH 41°12'21" WEST 293.61 feet;
1192) SOUTH 74°22'53" WEST 376.32 feet;
1193) SOUTH 44°00'42" WEST 305.20 feet;
1194) NORTH 80°20'15" WEST 127.25 feet;
1195) SOUTH 75°09'57" WEST 150.85 feet;
1196) SOUTH 47°11'32" WEST 548.83 feet;
1197) NORTH 26°43'39" WEST 223.54 feet;
1198) NORTH 46°40'18" WEST 148.61 feet;
1199) NORTH 08°14'30" WEST 312.59 feet;
1200) NORTH 45°26'50" WEST 308.79 feet;
1201) NORTH 03°01'11" WEST 349.29 feet;
1202) NORTH 27°37'51" WEST 296.22 feet;
1203) NORTH 48°25'23" WEST 378.93 feet;
1204) NORTH 71°52'51" WEST 122.91 feet;
1205) NORTH 02°11'34" EAST 241.42 feet;
1206) NORTH 11°25'21" WEST 154.46 feet;
1207) NORTH 37°48'05" WEST 501.51 feet;
1208) NORTH 02°36'15" WEST 351.85 feet;
1209) NORTH 30°37'01" WEST 454.72 feet;
1210) NORTH 00°14'16" WEST 182.10 feet;
1211) NORTH 28°57'53" WEST 142.91 feet;
1212) NORTH 05°05'47" EAST 62.48 feet;
1213) NORTH 48°57'18" EAST 331.95 feet;
1214) NORTH 22°23'34" EAST 673.02 feet;
1215) NORTH 05°18'49" WEST 126.58 feet;
1216) NORTH 32°23'01" WEST 333.92 feet;
1217) NORTH 04°16'39" EAST 167.12 feet;
1218) NORTH 68°32'03" EAST 248.69 feet;
1219) NORTH 31°56'27" EAST 477.11 feet;
1220) NORTH 04°10'04" EAST 780.24 feet;
1221) NORTH 14°15'56" WEST 464.76 feet;
1222) NORTH 60°39'03" WEST 583.37 feet;
1223) SOUTH 83°10'36" WEST 669.98 feet;

1224) SOUTH 46°17'28” WEST 435.70 feet;
1225) NORTH 89°03'25” WEST 260.05 feet;
1226) SOUTH 74°33'50” WEST 185.03 feet;
1227) SOUTH 57°20'07” WEST 313.30 feet;
1228) SOUTH 33°30'04” WEST 170.18 feet;
1229) SOUTH 03°05'42” WEST 420.08 feet;
1230) NORTH 73°11'23” WEST 462.24 feet;
1231) SOUTH 67°53'29” WEST 441.47 feet;
1232) SOUTH 27°57'55” WEST 422.03 feet;
1233) SOUTH 00°42'13” WEST 460.00 feet;
1234) SOUTH 19°32'02” EAST 600.25 feet;
1235) SOUTH 26°55'16” WEST 69.54 feet;
1236) NORTH 28°37'56” WEST 211.82 feet;
1237) NORTH 58°03'09” WEST 192.63 feet;
1238) NORTH 75°07'26” WEST 215.29 feet;
1239) NORTH 16°57'13” WEST 203.43 feet;
1240) NORTH 34°46'52” WEST 200.59 feet;
1241) NORTH 72°50'22” WEST 227.20 feet;
1242) SOUTH 68°42'40” WEST 310.81 feet;
1243) NORTH 86°50'15” WEST 141.74 feet;
1244) NORTH 06°24'31” WEST 502.66 feet;
1245) NORTH 41°15'24” WEST 402.88 feet to a point, having grid coordinate of N 1,872,788.46, E 6,217,295.39, said point being NORTH 27°26'38" WEST 154.97 feet from NGS Monument “M 351” (PID HS5352), being a 2-inch brass disc inside a monument lid with no stamp, having grid coordinates of N 1,872,650.93, E 6,217,366.81;

1246) NORTH 21°15'31” EAST 277.48 feet;
1247) NORTH 14°50'08” WEST 256.74 feet;
1248) NORTH 58°42'02” EAST 258.50 feet;
1249) NORTH 31°16'20” EAST 200.82 feet;
1250) NORTH 17°02'54” EAST 140.41 feet;
1251) NORTH 06°05'16” WEST 186.98 feet;
1252) SOUTH 83°51'25” EAST 209.00 feet;
1253) SOUTH 42°51'48” EAST 307.49 feet;
1254) SOUTH 86°30'38” EAST 366.62 feet;
1255) NORTH 64°26'42” EAST 484.21 feet;
1256) NORTH 34°49'02” EAST 697.06 feet;
1257) NORTH 33°46'29” EAST 299.96 feet;
1258) SOUTH 83°45'50” EAST 240.77 feet;
1259) SOUTH 87°00'08” EAST 126.53 feet;
1260) NORTH 76°50'21” EAST 124.50 feet;
1261) SOUTH 59°58'47” EAST 518.90 feet;
1262) SOUTH 84°50'34” EAST 1045.84 feet;
1263) NORTH 85°58'38” EAST 1297.37 feet;

1264) **NORTH 80°45'41" EAST 425.47 feet;**
1265) **NORTH 80°45'41" EAST 1162.38 feet;**
1266) **NORTH 66°06'29" EAST 1559.35 feet;**
1267) **NORTH 43°43'35" EAST 1140.17 feet;**
1268) **NORTH 43°43'34" EAST 173.75 feet;**
1269) **NORTH 43°38'48" EAST 196.37 feet** to a point with grid coordinates of **N 1,876,392.83, E 6,226,769.95,** said point being **SOUTH 14°01'45" EAST 1405.36 feet** from NGS Monument "M 357" (PID HS5358), being a railroad spike flushed with the road surface, having grid coordinates of **N 1,877,756.27, E 6,226,429.27;**

1270) **NORTH 43°38'49" EAST 1486.62 feet;**
1271) **NORTH 44°26'10" EAST 1387.22 feet;**
1272) **NORTH 40°47'20" EAST 1128.87 feet;**
1273) **NORTH 40°47'20" EAST 781.27 feet;**
1274) **NORTH 46°16'53" EAST 1342.78 feet;**
1275) **NORTH 44°45'33" EAST 225.80 feet;**
1276) **NORTH 44°45'32" EAST 1142.43 feet;**
1277) **NORTH 44°45'27" EAST 5.76 feet;**
1278) **NORTH 44°45'32" EAST 514.80 feet;**
1279) **NORTH 42°47'47" EAST 296.10 feet** to the **POINT OF BEGINNING.**

EXCEPTING THEREFROM the following five (5) Parcels:

Parcel 1:

COMMENCING at NGS Monument "M 362" (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of **N 1,884,274.45, E 6,233,024.82,** said railroad spike being **NORTH 16°38'26" WEST 64,286.80 feet** from NGS Monument "C 1193" (PID GU2195), being a 3-inch brass disc, punched and stamped "C 1193 1968", having grid coordinates of **N 1,822,679.97, E 6,251,434.42;**

Thence from said **Point of Commencement, SOUTH 30°34'27" WEST 15283.27 feet** to a point with grid coordinates of **N 1,871,115.98, E 6,225,250.94,** said point being the **TRUE POINT OF BEGINNING**;

Thence the following twenty-five (25) courses:

1. **SOUTH 76°33'15" EAST 466.61 feet;**
2. **SOUTH 24°15'32" EAST 388.73 feet;**
3. **SOUTH 09°05'47" WEST 423.95 feet;**
4. **SOUTH 19°07'41" WEST 343.41 feet;**
5. **SOUTH 54°14'19" WEST 192.67 feet;**
6. **SOUTH 88°43'28" WEST 219.07 feet;**
7. **SOUTH 57°12'06" WEST 229.03 feet;**
8. **SOUTH 76°46'01" WEST 447.05 feet;**
9. **SOUTH 34°13'15" WEST 377.57 feet;**

10. **SOUTH 62°02'45" WEST 468.45 feet;**
11. **SOUTH 00°54'51" WEST 562.81 feet;**
12. **SOUTH 24°46'57" WEST 265.51 feet;**
13. **SOUTH 48°39'04" WEST 678.89 feet;**
14. **SOUTH 77°49'03" WEST 319.78 feet;**
15. **NORTH 59°42'11" WEST 312.74 feet;**
16. **NORTH 30°13'29" WEST 300.87 feet;**
17. **NORTH 11°43'44" EAST 647.69 feet** to a point, having grid coordinate of **N 1,868,766.44, E 6,222,823.42,** said point being **SOUTH 54°33'12" EAST 6698.04 feet** from NGS Monument "M 351" (PID HS5352), being a 2-inch brass disc inside a monument lid with no stamp, having grid coordinates of **N 1,872,650.93, E 6,217,366.81;**
18. **NORTH 44°57'17" EAST 595.01 feet;**
19. **NORTH 63°33'45" EAST 306.17 feet;**
20. **NORTH 11°19'10" WEST 183.57 feet;**
21. **NORTH 11°21'45" EAST 346.98 feet;**
22. **NORTH 50°10'49" EAST 392.38 feet;**
23. **NORTH 33°24'29" EAST 980.77 feet;**
24. **NORTH 73°04'55" EAST 334.84 feet;**
25. **NORTH 79°01'12" EAST 548.96 feet** to the **POINT OF BEGINNING.**

Parcel 2:

COMMENCING at NGS Monument "M 362" (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of **N 1,884,274.45, E 6,233,024.82,** said railroad spike being **NORTH 16°38'26" WEST 64,286.80 feet** from NGS Monument "C 1193" (PID GU2195), being a 3-inch brass disc, punched and stamped "C 1193 1968", having grid coordinates of **N 1,822,679.97, E 6,251,434.42;**

Thence from said **Point of Commencement, SOUTH 12°03'11" EAST 44428.78 feet** to a point with grid coordinates of **N 1,840,825.10, E 6,242,302.26,** said point being the **TRUE POINT OF BEGINNING** ;

Thence the following fifteen (15) courses:

1. **SOUTH 46°45'14" EAST 349.77 feet** to a point, having grid coordinate of **N 1,840,585.46, E 6,242,557.04,** said point being **SOUTH 23°17'15" WEST 2224.15 feet** from NGS Monument "M 149" (PID HS2736), being a 2.5-inch brass disc, punched and stamped "M149 1993", having grid coordinates of **N 1,842,628.42, E 6,243,436.35;**
2. **SOUTH 14°32'32" EAST 514.01 feet;**
3. **SOUTH 37°27'39" EAST 227.93 feet;**
4. **SOUTH 09°35'20" EAST 440.86 feet;**
5. **SOUTH 27°38'11" WEST 924.24 feet;**
6. **SOUTH 44°02'02" WEST 1196.74 feet;**
7. **NORTH 74°53'46" WEST 465.29 feet;**
8. **NORTH 20°57'58" WEST 504.17 feet;**
9. **NORTH 04°55'25" WEST 283.86 feet;**

10. **NORTH 29°52'50" EAST 386.44 feet;**
11. **NORTH 48°48'12" WEST 358.53 feet;**
12. **NORTH 02°40'26" WEST 398.60 feet;**
13. **NORTH 32°19'14" EAST 663.81 feet;**
14. **NORTH 46°01'08" EAST 795.47 feet;**
15. **NORTH 81°19'04" EAST 492.82** to the **POINT OF BEGINNING.**

Parcel 3:

COMMENCING at NGS Monument "M 362" (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of **N 1,884,274.45, E 6,233,024.82,** said railroad spike being **NORTH 16°38'26" WEST 64,286.80 feet** from NGS Monument "C 1193" (PID GU2195), being a 3-inch brass disc, punched and stamped "C 1193 1968", having grid coordinates of **N 1,822,679.97, E 6,251,434.42;**

Thence from said **Point of Commencement, SOUTH 08°34'56" EAST 45742.52 feet** to a point with grid coordinates of **N 1,839,044.13, E 6,239,850.98,** said point being the **TRUE POINT OF BEGINNING ;**

Thence the following eight (8) courses:

1. **SOUTH 55°21'38" EAST 260.49 feet** to a point, having grid coordinate of **N 1,838,896.07, E 6,240,065.30,** said point being **SOUTH 42°05'18" WEST 5029.36 feet** from NGS Monument "M 149" (PID HS2736), being a 2.5-inch brass disc, punched and stamped "M149 1993", having grid coordinates of **N 1,842,628.42, E 6,243,436.35;**
2. **SOUTH 27°18'48" EAST 480.27 feet;**
3. **SOUTH 18°57'15" WEST 480.97 feet;**
4. **SOUTH 63°45'00" WEST 251.10 feet;**
5. **NORTH 68°11'40" WEST 541.06 feet;**
6. **NORTH 20°06'42" WEST 514.36 feet;**
7. **NORTH 27°39'41" EAST 404.15 feet;**
8. **NORTH 77°17'47" EAST 449.33** to the **POINT OF BEGINNING.**

Parcel 4:

COMMENCING at NGS Monument "M 362" (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of **N 1,884,274.45, E 6,233,024.82,** said railroad spike being **NORTH 16°38'26" WEST 64,286.80 feet** from NGS Monument "C 1193" (PID GU2195), being a 3-inch brass disc, punched and stamped "C 1193 1968", having grid coordinates of **N 1,822,679.97, E 6,251,434.42;**

Thence from said **Point of Commencement, SOUTH 10°41'26" EAST 62076.00 feet** to a point with grid coordinates of **N 1,823,275.87, E 6,244,540.15,** said point being the **TRUE POINT OF BEGINNING ;**

Thence the following sixteen (16) courses:

1. **SOUTH 75°10'20" EAST 611.74 feet;**
2. **SOUTH 53°40'24" EAST 845.82 feet** to a point, having grid coordinates of **N 1,822,618.26, E 6,245,812.96,** said point being **NORTH 61°16'14" WEST 2902.92 feet** from SCVWD Benchmark "BM021", being a 2-inch brass disc, punched and stamped "BM 021", having grid coordinates of **N 1,821,222.90, E 6,248,358.53;**

3. **SOUTH 09°11'28" EAST 275.49 feet;**
4. **SOUTH 15°38'01" WEST 232.90 feet;**
5. **SOUTH 43°47'41" WEST 309.68 feet;**
6. **SOUTH 71°57'20" WEST 448.67 feet;**
7. **SOUTH 23°30'06" EAST 270.92 feet;**
8. **SOUTH 09°09'08" WEST 241.46 feet;**
9. **SOUTH 27°57'29" WEST 337.10 feet;**
10. **SOUTH 76°51'16" WEST 239.61 feet;**
11. **NORTH 73°02'42" WEST 336.63 feet;**
12. **NORTH 47°15'31" WEST 528.25 feet;**
13. **NORTH 29°23'03" WEST 667.50 feet;**
14. **NORTH 01°59'39" EAST 975.12 feet;**
15. **NORTH 47°44'47" EAST 365.99 feet;**
16. **NORTH 77°39'47" EAST 451.70** to the **POINT OF BEGINNING.**

Parcel 5:

COMMENCING at NGS Monument "M 362" (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of **N 1,884,274.45, E 6,233,024.82,** said railroad spike being **NORTH 16°38'26" WEST 64,286.80 feet** from NGS Monument "C 1193" (PID GU2195), being a 3-inch brass disc, punched and stamped "C 1193 1968", having grid coordinates of **N 1,822,679.97, E 6,251,434.42;**

Thence from said **Point of Commencement, SOUTH 12°30'55" EAST 63843.07 feet** to a point with grid coordinates of **N 1,821,948.40, E 6,246,859.61,** said point being the **TRUE POINT OF BEGINNING ;**

Thence the following eleven (11) courses:

1. **SOUTH 67°24'48" EAST 393.67 feet;**
2. **SOUTH 15°40'12" EAST 273.96 feet;**
3. **SOUTH 35°07'58" WEST 422.71 feet;**
4. **SOUTH 09°14'24" EAST 321.96 feet** to a point, having grid coordinates of **N 1,820,869.93, E 6,247,105.52,** said point being **SOUTH 74°16'04" WEST 1301.78 feet** from SCVWD Benchmark "BM021", being a 2-inch brass disc, punched and stamped "BM 021", having grid coordinates of **N 1,821,222.90, E 6,248,358.53;**

5. **SOUTH 51°52'55" WEST 468.75 feet;**
6. **NORTH 89°07'20" WEST 634.72 feet;**
7. **NORTH 62°31'17" WEST 394.87 feet;**

8. NORTH 23°27'42" WEST 330.35 feet;
9. NORTH 14°38'06" EAST 549.43 feet;
10. NORTH 55°11'33" EAST 377.79 feet;
11. NORTH 80°58'15" EAST 800.27 to the POINT OF BEGINNING.

Containing 1,705,688,803 square feet of land (39,488.86 acres), more or less.

END OF DESCRIPTION

Basis of Bearings:
Bearings, coordinates, and distances used in above description are based on the California Coordinate System of 1983, Zone III, North American Datum of 1983 (CSRC) Epoch 2017.50. Distances are in grid unless otherwise noted, ground distances may be obtained by multiplying by a combination factor of 0.99998858 calculated at the abovementioned NGS Monument "C 1193" (PID GU2195).

Surveyor's Statement:
This land description has been prepared by me, or under my direction, in conformance with the Professional Land Surveyors' Act.

Prepared By:

Frank A. Borges, P.L.S.

March 5, 2020
Date

FRANK A. BORGES
No. 7922
Exp: 12-31-21

Appendix L-6

Adopted Metes and Bounds for Zone W-7

BOARD OF DIRECTORS
SANTA CLARA VALLEY WATER DISTRICT

RESOLUTION NO. 20-14

RESOLUTION ESTABLISHING GROUNDWATER BENEFIT ZONE W-7

WHEREAS, the Santa Clara Valley Water District (Valley Water) is charged with managing the groundwater subbasins in Santa Clara County per the Santa Clara Valley Water District Act and the Sustainable Groundwater Management Act; and

WHEREAS, the Santa Clara Valley Water District Act authorizes the Valley Water Board of Directors to establish zones encompassing areas where groundwater pumpers benefit directly and indirectly from Valley Water activities to protect and augment water supplies; and

WHEREAS, by assessing a groundwater production charge on water producing facilities within the groundwater benefit zones, Valley Water funds and implements projects and activities for the benefit of groundwater pumpers in the zone, ensuring continued groundwater supply and sustainability, consistent with the purposes set forth in the District Act and requirements of the Sustainable Groundwater Management Act; and

WHEREAS, Valley Water established the two primary groundwater benefit zones (Zones W-2 and W-5 representing North and South County, respectively) in 1963 and 1977, respectively; and

WHEREAS, Valley Water's activities benefitting groundwater pumpers have changed, and new and more detailed information has become available regarding the groundwater subbasins Valley Water manages since the existing groundwater benefit zones were first established; and

WHEREAS, Valley Water undertook an independent, science-based study beginning in 2014 to ensure the zones reflect the most recent and relevant data regarding the services and benefits received by well owners and operators (well users); and

WHEREAS, Valley Water conducted the study with extensive public outreach including notices to potentially affected well users and interested parties, presentations to Valley Water Board of Directors committees and public agencies, meetings and communication with individual well users and water retailers, and open houses; and

WHEREAS, after completing the study using the best available science and considering information provided by well users, it was determined that all well users in proposed modified Zone W-7 are benefiting in a reasonably similar way from Valley Water activities to protect and augment groundwater supplies; and

WHEREAS, the results of the study and the recommendation to establish Zone W-7 were presented to the Board of Directors on August 27, 2019, and October 8, 2019; and

WHEREAS, on October 8, 2019, the Board of Directors directed staff to prepare metes and bounds to establish groundwater benefit zone W-7 for consideration at a public hearing.

NOW, THEREFORE BE IT RESOLVED that the Board of Directors of the Santa Clara Valley Water District declares as follows:

1. The boundaries of groundwater benefit zone W-7 are established as described in Exhibit A.
2. Groundwater benefit zone W-7 shall become effective on July 1, 2020.

PASSED AND ADOPTED by the Board of Directors of the Santa Clara Valley Water District by the following vote on April 28, 2020:

AYES: Directors R. Santos, G. Kremen, T. Estremera, N. Hsueh
B. Keegan, L. LeZotte, J. Varela

NOES: Directors None

ABSENT: Directors None

ABSTAIN: Directors None

SANTA CLARA VALLEY WATER DISTRICT

NAI HSUEH
Chair, Board of Directors

ATTEST: MICHELE L. KING, CMC

Michele L. King
Clerk, Board of Directors

EXHIBIT A
COVERSHEET

METES AND BOUNDS DESCRIPTION FOR SANTA CLARA VALLEY WATER DISTRICT GROUNDWATER BENEFIT ZONE W-7 AT SANTA CLARA COUNTY, CALIFORNIA

No. of Pages:	9
Exhibit Attachments:	Attachment 1: Metes and Bounds Description for Santa Clara Valley Water District Groundwater Benefit Zone W-7 at Santa Clara County, California

METES AND BOUNDS DESCRIPTION
FOR
SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT ZONE W-7
AT
SANTA CLARA COUNTY, CALIFORNIA

ALL THAT CERTAIN AREA situate in the County of Santa Clara, State of California, being more particularly described as follows:

COMMENCING at NGS Monument "QQ 453" (PID HS2787), being a 2-inch brass disc, punched and stamped "QQ 453", having grid coordinates of **N 1,918,486.92, E 6,182,012.53,** said brass disc being **SOUTH 50°56'16" EAST 85,739.16 feet** from NGS Monument "LOCKHEED" (PID DG6887), being a 3-inch brass disc, punched and stamped "LOCKHEED", having grid coordinates of **N 1,972,516.68, E 6,115,439.35;**

Thence from said **Point of Commencement, SOUTH 54°56'55" EAST 19,076.99 feet** to point with grid coordinates of **N 1,907,530.83, E 6,197,629.69,** said point being the **TRUE POINT OF BEGINNING ;**

Thence the following three hundred forty-two (342) courses:

1. **NORTH 54°53'58" EAST 1256.28 feet** to a point, having grid coordinates of **N 1,908,253.21, E 6,198,657.51,** said point being **SOUTH 68°15'26" EAST 6826.51 feet** from SCVWD Benchmark "BM561", being a 2-inch brass disc, punched and stamped "BM 561 RESET 2001", having grid coordinates of **N 1,910,782.03, E 6,192,316.66;**

2. **SOUTH 44°19'07" EAST 293.80 feet;**
3. **SOUTH 59°19'19" EAST 534.65 feet;**
4. **SOUTH 31°06'28" EAST 251.83 feet;**
5. **SOUTH 55°57'14" EAST 84.57 feet;**
6. **SOUTH 22°30'00" WEST 169.83 feet;**
7. **SOUTH 07°30'00" EAST 169.83 feet;**
8. **SOUTH 32°28'51" EAST 615.92 feet;**
9. **SOUTH 60°15'39" EAST 512.26 feet;**
10. **SOUTH 80°37'30" EAST 106.89 feet;**
11. **NORTH 73°07'30" EAST 190.48 feet;**
12. **SOUTH 07°35'47" WEST 74.24 feet;**
13. **SOUTH 61°58'08" WEST 314.50 feet;**
14. **SOUTH 28°52'44" WEST 214.95 feet;**
15. **SOUTH 10°31'18" EAST 372.71 feet;**
16. **SOUTH 41°47'17" EAST 202.66 feet;**
17. **SOUTH 59°46'44" EAST 339.98 feet;**
18. **SOUTH 77°14'15" EAST 363.55 feet;**
19. **NORTH 79°27'27" EAST 223.54 feet;**
20. **SOUTH 73°39'04" EAST 250.80 feet;**
21. **SOUTH 03°45'00" EAST 169.83 feet;**
22. **SOUTH 35°53'04" EAST 262.31 feet;**

23. SOUTH 60°05'41" EAST 209.89 feet;
24. SOUTH 14°41'16" EAST 308.36 feet;
25. SOUTH 41°15'00" EAST 128.01 feet;
26. SOUTH 67°30'00" EAST 169.83 feet;
27. SOUTH 31°46'20" EAST 192.49 feet;
28. SOUTH 72°04'06" EAST 441.19 feet;
29. SOUTH 79°42'56" EAST 251.00 feet;
30. SOUTH 45°27'21" EAST 399.21 feet;
31. SOUTH 64°22'51" EAST 212.69 feet;
32. SOUTH 19°36'50" EAST 1119.13 feet;
33. SOUTH 43°57'50" EAST 163.80 feet;
34. SOUTH 51°22'55" EAST 397.19 feet;
35. SOUTH 89°58'05" EAST 254.17 feet;
36. NORTH 54°36'21" EAST 568.05 feet;
37. SOUTH 32°32'22" EAST 194.40 feet;
38. SOUTH 45°34'26" EAST 341.04 feet;
39. SOUTH 60°26'54" EAST 207.97 feet;
40. SOUTH 06°11'17" EAST 786.96 feet;
41. SOUTH 25°26'20" EAST 518.80 feet;
42. SOUTH 58°35'01" EAST 388.62 feet;
43. NORTH 82°38'42" EAST 265.42 feet;
44. SOUTH 55°03'01" EAST 348.77 feet;
45. SOUTH 70°23'31" EAST 203.40 feet;
46. SOUTH 25°15'43" EAST 487.77 feet;
47. SOUTH 52°56'13" EAST 128.63 feet;
48. SOUTH 24°17'34" EAST 134.85 feet;
49. SOUTH 36°10'07" EAST 376.86 feet;
50. SOUTH 20°43'22" EAST 416.69 feet;
51. SOUTH 53°16'53" EAST 251.30 feet;
52. SOUTH 21°33'28" EAST 312.80 feet;
53. SOUTH 68°22'15" EAST 356.78 feet;
54. SOUTH 37°31'38" EAST 318.11 feet;
55. SOUTH 62°19'49" EAST 157.31 feet;
56. SOUTH 40°51'45" EAST 434.63 feet;
57. SOUTH 61°59'11" EAST 596.20 feet;
58. SOUTH 06°51'24" EAST 185.57 feet;
59. SOUTH 33°58'15" EAST 580.77 feet;
60. SOUTH 67°41'19" EAST 303.90 feet;
61. SOUTH 88°52'29" EAST 109.29 feet;
62. SOUTH 19°43'55" EAST 386.22 feet;
63. SOUTH 42°58'34" EAST 231.58 feet;
64. SOUTH 80°38'19" EAST 382.19 feet;
65. SOUTH 14°28'06" EAST 330.79 feet;
66. SOUTH 39°25'48" EAST 295.69 feet;
67. SOUTH 76°47'33" EAST 285.66 feet;
68. NORTH 76°48'37" EAST 487.63 feet;
69. NORTH 52°16'44" EAST 170.48 feet;
70. SOUTH 22°32'07" EAST 167.73 feet;
71. SOUTH 53°50'13" EAST 385.28 feet;
72. SOUTH 80°36'55" EAST 531.67 feet;
73. SOUTH 05°43'30" WEST 272.29 feet;

74. **SOUTH 02°26'27” EAST 264.72 feet;**
75. **SOUTH 18°13'19” EAST 178.45 feet;**
76. **SOUTH 41°45'59” EAST 373.88 feet;**
77. **SOUTH 67°47'03” EAST 429.30 feet;**
78. **NORTH 85°06'38” EAST 151.00 feet;**
79. **SOUTH 01°07'18” WEST 388.26 feet;**
80. **SOUTH 37°18'29” EAST 267.26 feet;**
81. **SOUTH 50°08'27” EAST 82.99 feet;**
82. **SOUTH 17°54'43” WEST 155.10** feet to a point, having grid coordinates of N **1,893,268.71, E 6,213,796.28,** said point being **SOUTH 48°34'57" EAST 337.96 feet** from NGS Monument “HPGN CA 04 03” (PID HS5407), being a 2.5-inch aluminum disc, punched and stamped “HPGN-CALIF. STA. 04-03 1990”, having grid coordinates of **N 1,893,492.28, E 6,213,542.84;**

83. **NORTH 57°04'36” WEST 778.57 feet;**
84. **NORTH 46°55'02” WEST 512.47 feet;**
85. **NORTH 63°09'45” WEST 614.85 feet;**
86. **SOUTH 88°35'03” WEST 1078.66 feet;**
87. **SOUTH 41°44'00” WEST 361.95 feet;**
88. **SOUTH 03°36'31” WEST 282.81 feet;**
89. **SOUTH 41°35'28” EAST 391.19** feet to a point, having grid coordinates of N **1,893,447.93, E 6,211,142.43,** said point being **NORTH 22°30'59" EAST 1934.97 feet** from NGS Monument “PERRYS RM 4” (PID HS2771), being a 3-inch brass disc, punched and stamped “PERRYS NO 4 1946 1967”, having grid coordinates of N **1,891,660.46, E 6,210,401.44;**

90. **SOUTH 65°42'13” EAST 1480.73 feet;**
91. **SOUTH 56°57'12” EAST 1945.58 feet;**
92. **SOUTH 78°41'12” EAST 1205.08 feet;**
93. **NORTH 62°53'28” EAST 227.67 feet;**
94. **SOUTH 63°06'55” EAST 203.67 feet;**
95. **SOUTH 68°36'09” EAST 395.81 feet;**
96. **SOUTH 82°57'53” EAST 162.76 feet;**
97. **SOUTH 10°16'12” EAST 369.73 feet;**
98. **SOUTH 38°41'58” EAST 345.02 feet;**
99. **SOUTH 10°37'27” EAST 302.67 feet;**
100. **SOUTH 29°53'09” EAST 515.16 feet;**
101. **SOUTH 49°40'46” EAST 629.01 feet;**
102. **SOUTH 80°18'50” EAST 169.28 feet;**
103. **SOUTH 33°08'30” EAST 230.52 feet;**
104. **SOUTH 50°53'56” EAST 244.82 feet;**
105. **SOUTH 69°20'31” EAST 634.18 feet;**
106. **NORTH 82°37'57” EAST 135.78 feet;**
107. **SOUTH 41°34'43” EAST 1400.71 feet;**
108. **SOUTH 58°37'51” EAST 471.89** feet to a point, having grid coordinates of N **1,887,728.72, E 6,219,836.04,** said point being **NORTH 39°10'05" EAST 5117.39 feet** from NGS Monument “J 453” (PID HS2762), being a 2.5-inch brass disc, punched and stamped “J 453 1954”, having grid coordinates of **N 1,883,761.23, E 6,216,603.90;**

109. **NORTH 84°21'03” EAST 554.02 feet;**
110. **SOUTH 55°40'57” EAST 982.19 feet;**

111. SOUTH 75°31'52" EAST 351.76 feet;
112. SOUTH 57°35'02" EAST 269.63 feet;
113. SOUTH 62°22'44" EAST 215.77 feet;
114. SOUTH 76°40'14" EAST 503.57 feet;
115. SOUTH 66°51'03" EAST 677.16 feet;
116. NORTH 88°19'34" EAST 773.62 feet;
117. SOUTH 74°10'10" EAST 573.92 feet;
118. SOUTH 62°45'18" EAST 448.80 feet;
119. SOUTH 40°06'35" EAST 483.15 feet;
120. SOUTH 72°09'26" EAST 380.44 feet;
121. NORTH 69°45'24" EAST 504.45 feet;
122. SOUTH 87°20'54" EAST 392.76 feet;
123. SOUTH 61°28'19" EAST 316.66 feet to a point, having grid coordinates of N 1,885,694.37, E 6,226,612.33, said point being NORTH 51°06'14" WEST 72.81 feet from NGS Monument "M 099" (PID HS5328), being an 1-inch iron pipe with a yellow plug 7-inches below surface, having grid coordinates of N 1885648.65, E 6,226,669.00;

124. SOUTH 79°48'21" EAST 871.35 feet;
125. SOUTH 72°12'13" EAST 1340.62 feet;
126. SOUTH 82°05'34" EAST 1307.58 feet;
127. SOUTH 57°33'16" EAST 343.06 feet;
128. NORTH 84°35'08" EAST 1001.65 feet;
129. SOUTH 41°21'42" EAST 624.98 feet;
130. SOUTH 78°53'17" EAST 225.22 feet;
131. SOUTH 04°29'59" EAST 220.18 feet;
132. SOUTH 24°08'55" EAST 130.72 feet;
133. SOUTH 00°28'16" EAST 431.13 feet;
134. SOUTH 00°28'16" EAST 426.84 feet;
135. SOUTH 17°37'10" EAST 193.47 feet;
136. SOUTH 34°46'04" EAST 558.43 feet;
137. SOUTH 40°26'42" EAST 153.60 feet to a point, having grid coordinates of N 1,882,391.76, E 6,232,516.68, said point being SOUTH 15°06'15" WEST 1950.06 feet from NGS Monument "M 362" (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of N 1,884,274.45, E 6,233,024.82;

138. SOUTH 42°47'47" WEST 296.10 feet;
139. SOUTH 44°45'32" WEST 514.80 feet;
140. SOUTH 44°45'27" WEST 5.76 feet;
141. SOUTH 44°45'32" WEST 1142.43 feet;
142. SOUTH 44°45'33" WEST 225.80 feet;
143. SOUTH 46°16'53" WEST 1342.78 feet;
144. SOUTH 40°47'20" WEST 781.27 feet;
145. SOUTH 40°47'20" WEST 1128.87 feet;
146. SOUTH 44°26'10" WEST 1387.22 feet;
147. SOUTH 43°38'49" WEST 1486.62 feet to a point with grid coordinates of N 1876392.83, E 1876392.83, said point being SOUTH 14°01'45" EAST 1405.36 feet from NGS Monument "M 357" (PID HS5358), being a railroad spike flushed with the road surface, having grid coordinates of N 1,877,756.27, E 6,226,429.27;

148. SOUTH 43°38'48" WEST 196.37 feet;
149. SOUTH 43°43'34" WEST 173.75 feet;

150. SOUTH 43°43'35” WEST 1140.17 feet;
151. SOUTH 66°06'29” WEST 1559.35 feet;
152. SOUTH 80°45'41” WEST 1162.38 feet;
153. SOUTH 80°45'41” WEST 425.47 feet;
154. SOUTH 85°58'38” WEST 1297.37 feet;
155. NORTH 84°50'34” WEST 1045.84 feet;
156. NORTH 59°58'47” WEST 516.91 feet to a point, having grid coordinates of **N 1,874,676.35, E 6,219,949.88,** said point being **NORTH 51°53'58" EAST 3282.47 feet** from NGS Monument “M 351” (PID HS5352), being a 2-inch brass disc inside a monument well with no stamp, having grid coordinates of **N 1,872,650.93, E 6,217,366.81;**

157. NORTH 55°16'53” EAST 105.00 feet;
158. NORTH 37°08'25” EAST 114.36 feet;
159. NORTH 14°29'09” EAST 224.01 feet;
160. NORTH 43°18'37” EAST 164.99 feet;
161. NORTH 14°07'14” EAST 206.51 feet;
162. NORTH 15°27'02” WEST 164.91 feet;
163. NORTH 19°27'09” EAST 103.46 feet;
164. NORTH 79°26'13” EAST 152.36 feet;
165. NORTH 61°55'00” EAST 443.86 feet;
166. NORTH 39°27'07” EAST 621.89 feet;
167. NORTH 05°33'37” EAST 431.95 feet;
168. NORTH 21°26'48” WEST 827.64 feet;
169. NORTH 50°03'05” WEST 631.42 feet;
170. NORTH 37°58'40” WEST 372.88 feet;
171. NORTH 62°27'17” WEST 356.45 feet;
172. SOUTH 87°11'31” WEST 413.86 feet;
173. NORTH 78°28'35” WEST 265.44 feet;
174. SOUTH 66°18'03” WEST 331.51 feet;
175. NORTH 51°55'40” WEST 68.51 feet;
176. NORTH 33°36'11” WEST 696.42 feet;
177. NORTH 08°08'10” WEST 269.16 feet;
178. NORTH 28°53'54” WEST 383.26 feet;
179. NORTH 50°26'27” WEST 191.24 feet;
180. NORTH 84°57'23” WEST 481.28 feet to a point, having grid coordinates of **N 1,879,690.46, E 1,879,690.46** said point being **NORTH 33°43'13" WEST 282.24 feet** from NGS Monument “A 1077 X” (PID HS2758), being a 3-inch brass disc, punched and stamped “A 1077 X 1967”, having grid coordinates of **N 1,879,455.71, E 6,217,851.74;**

181. NORTH 66°03'24” WEST 403.06 feet;
182. SOUTH 81°01'42” WEST 715.14 feet;
183. NORTH 51°14'03” WEST 1376.69 feet;
184. NORTH 41°18'00” WEST 338.67 feet to a point, having grid coordinates of **N 1,880,858.94, E 6,215,323.34,** said point being **SOUTH 72°05'09" WEST 3068.84 feet** from NGS Monument “A 177” (PID HS2757), being a 3-inch brass disc, punched and stamped “A 177 1934”, having grid coordinates of **N 1,881,802.89, E 6,218,243.41;**

185. NORTH 87°04'43” WEST 450.27 feet;
186. SOUTH 68°03'55” WEST 400.47 feet;

187. NORTH 88°51'51" WEST 52.98 feet;
188. NORTH 26°35'16" WEST 126.06 feet;
189. NORTH 51°54'17" WEST 421.26 feet;
190. NORTH 78°06'59" WEST 698.20 feet;
191. SOUTH 81°21'45" WEST 218.91 feet;
192. NORTH 30°56'20" WEST 393.03 feet;
193. NORTH 53°33'26" WEST 312.64 feet;
194. NORTH 09°08'29" EAST 399.49 feet;
195. NORTH 48°01'42" WEST 297.75 feet;
196. SOUTH 87°07'56" WEST 327.63 feet;
197. NORTH 32°58'01" WEST 913.88 feet;
198. NORTH 56°51'21" WEST 522.08 feet;
199. NORTH 35°36'37" WEST 478.70 feet;
200. NORTH 64°09'48" WEST 371.05 feet;
201. SOUTH 86°52'35" WEST 184.02 feet;
202. NORTH 43°07'11" WEST 406.11 feet;
203. NORTH 68°51'35" WEST 771.17 feet;
204. NORTH 53°15'54" WEST 592.46 feet;
205. NORTH 78°39'57" WEST 422.03 feet;
206. SOUTH 72°38'19" WEST 243.19 feet;
207. NORTH 56°16'25" WEST 163.94 feet;
208. NORTH 83°07'00" WEST 496.93 feet;
209. NORTH 58°25'24" WEST 522.55 feet;
210. NORTH 43°49'44" WEST 532.45 feet;
211. NORTH 79°54'55" WEST 528.35 feet;
212. NORTH 60°13'53" WEST 443.29 feet;
213. NORTH 77°49'40" WEST 198.37 feet;
214. NORTH 18°48'11" WEST 300.29 feet;
215. NORTH 40°04'40" WEST 416.35 feet;
216. NORTH 69°38'48" WEST 344.42 feet;
217. NORTH 55°37'38" WEST 231.08 feet;
218. NORTH 83°53'04" WEST 266.52 feet;
219. SOUTH 82°23'35" WEST 278.03 feet;
220. NORTH 36°21'46" WEST 298.09 feet;
221. NORTH 40°47'43" WEST 279.55 feet;
222. NORTH 32°29'30" WEST 1436.66 feet;
223. NORTH 32°05'40" WEST 345.70 feet;
224. NORTH 44°43'46" WEST 386.94 feet;
225. NORTH 66°24'26" WEST 171.20 feet;
226. NORTH 15°02'02" WEST 222.69 feet;
227. NORTH 42°01'16" WEST 350.55 feet;
228. NORTH 75°50'41" WEST 205.38 feet;
229. NORTH 17°53'59" WEST 159.12 feet;
230. NORTH 31°58'07" WEST 354.34 feet;
231. NORTH 12°28'01" WEST 383.06 feet;
232. NORTH 32°01'02" WEST 494.10 feet;
233. NORTH 55°42'04" WEST 676.82 feet;
234. SOUTH 69°19'02" WEST 417.44 feet;
235. SOUTH 17°31'25" WEST 347.64 feet;
236. SOUTH 82°21'42" WEST 232.61 feet;
237. SOUTH 61°39'27" WEST 155.87 feet;

238. NORTH 36°20'46" WEST 366.09 feet;
239. NORTH 88°04'50" WEST 362.22 feet to a point, having grid coordinates of N 1,891,031.60, E 6,199,595.12, said point being NORTH 55°03'39" EAST 5828.00 feet from NGS Monument "HJH 51" (PID HS5239), being a 3-inch brass disc, punched and stamped "HFH 51 513 1948", having grid coordinates of N 1,887,693.87, E 6,194,817.56;

240. NORTH 23°55'46" EAST 377.69 feet;
241. NORTH 20°34'08" WEST 288.52 feet;
242. NORTH 63°21'42" WEST 422.14 feet;
243. NORTH 19°40'48" WEST 768.32 feet;
244. NORTH 52°34'45" WEST 341.88 feet;
245. NORTH 88°55'51" WEST 204.95 feet;
246. NORTH 54°03'52" WEST 352.74 feet;
247. NORTH 75°39'31" WEST 290.58 feet;
248. NORTH 26°53'46" WEST 359.93 feet;
249. NORTH 81°28'48" WEST 311.15 feet;
250. SOUTH 70°12'47" WEST 906.90 feet;
251. NORTH 84°57'37" WEST 615.36 feet;
252. NORTH 34°35'30" EAST 551.21 feet;
253. NORTH 14°33'42" WEST 463.36 feet;
254. NORTH 48°50'16" WEST 685.74 feet;
255. NORTH 24°52'15" WEST 217.77 feet;
256. NORTH 54°25'46" WEST 465.76 feet;
257. NORTH 20°35'26" WEST 195.27 feet;
258. NORTH 49°39'27" WEST 301.52 feet;
259. NORTH 16°12'29" WEST 333.36 feet;
260. NORTH 42°11'13" WEST 554.91 feet;
261. NORTH 75°33'17" WEST 227.92 feet;
262. NORTH 16°21'14" WEST 101.00 feet;
263. SOUTH 86°05'23" EAST 254.70 feet;
264. NORTH 64°42'25" EAST 239.18 feet;
265. SOUTH 40°56'41" EAST 146.13 feet;
266. SOUTH 53°51'05" EAST 876.36 feet;
267. SOUTH 70°26'03" EAST 187.27 feet;
268. SOUTH 88°21'17" EAST 887.00 feet;
269. NORTH 51°13'26" EAST 662.72 feet;
270. NORTH 22°43'37" EAST 556.78 feet;
271. NORTH 58°12'25" EAST 86.18 feet;
272. SOUTH 86°25'17" EAST 215.65 feet;
273. NORTH 73°21'21" EAST 346.88 feet;
274. NORTH 38°07'25" EAST 327.37 feet;
275. SOUTH 71°00'01" EAST 216.89 feet;
276. SOUTH 11°36'51" EAST 147.75 feet;
277. SOUTH 31°11'25" EAST 459.87 feet;
278. SOUTH 79°02'48" EAST 369.71 feet;
279. SOUTH 58°37'09" EAST 276.00 feet;
280. SOUTH 85°50'40" EAST 286.95 feet to a point, having grid coordinates of N 1,896,092.74, E 6,199,476.17, said point being SOUTH 21°57'49" WEST 267.69 feet from NGS Monument "X 1457" (PID HS5242), being a steel rod inside a monument

well, punched and stamped "X 1457 1990", having grid coordinates of N 1,896,341.00, E 6,199,576.30;

281. NORTH 63°04'25" EAST 447.37 feet;
282. NORTH 09°43'39" EAST 586.03 feet;
283. NORTH 89°50'41" EAST 279.36 feet;
284. SOUTH 04°11'06" WEST 235.20 feet;
285. SOUTH 18°43'41" EAST 218.01 feet;
286. SOUTH 38°08'00" EAST 239.76 feet;
287. SOUTH 60°52'58" EAST 253.74 feet;
288. SOUTH 83°38'32" EAST 340.71 feet;
289. NORTH 68°49'39" EAST 303.29 feet;
290. NORTH 35°12'53" EAST 579.74 feet;
291. NORTH 06°03'34" WEST 423.64 feet;
292. NORTH 40°52'06" WEST 662.31 feet;
293. NORTH 73°40'52" WEST 316.15 feet;
294. NORTH 26°48'29" WEST 563.70 feet;
295. NORTH 76°09'31" WEST 606.16 feet;
296. SOUTH 66°42'30" WEST 401.43 feet;
297. NORTH 45°17'56" WEST 347.12 feet;
298. NORTH 61°42'56" WEST 420.33 feet;
299. NORTH 13°59'26" WEST 342.45 feet;
300. NORTH 46°39'12" WEST 389.34 feet;
301. SOUTH 85°45'38" WEST 592.01 feet;
302. NORTH 27°08'34" WEST 128.07 feet;
303. NORTH 02°51'51" WEST 255.53 feet;
304. NORTH 32°36'07" WEST 215.66 feet;
305. NORTH 02°23'34" WEST 469.18 feet;
306. NORTH 51°33'40" WEST 392.73 feet;
307. NORTH 22°04'15" WEST 532.00 feet;
308. NORTH 47°24'54" WEST 622.30 feet;
309. NORTH 71°08'18" WEST 564.36 feet;
310. NORTH 36°45'37" WEST 451.48 feet;
311. NORTH 63°08'57" WEST 715.06 feet;
312. NORTH 76°09'21" WEST 523.11 feet;
313. NORTH 16°34'48" WEST 97.13 feet;
314. NORTH 54°56'08" EAST 349.80 feet;
315. NORTH 54°56'08" EAST 178.98 feet;
316. NORTH 83°58'41" EAST 383.01 feet;
317. NORTH 47°37'07" EAST 179.48 feet;
318. NORTH 07°57'28" EAST 446.34 feet;
319. SOUTH 53°11'50" EAST 302.60 feet;
320. SOUTH 81°53'02" EAST 346.55 feet;
321. SOUTH 32°54'15" EAST 436.41 feet;
322. SOUTH 59°06'59" EAST 435.74 feet;
323. NORTH 85°30'58" EAST 538.28 feet;
324. NORTH 62°13'52" EAST 377.76 feet;
325. SOUTH 82°41'38" EAST 270.24 feet;
326. NORTH 65°31'37" EAST 429.61 feet;
327. NORTH 29°56'39" EAST 1133.35 feet;
328. NORTH 01°11'20" EAST 200.81 feet;

329. NORTH 35°59'17" WEST 450.16 feet;
330. NORTH 73°31'13" WEST 251.57 feet;
331. NORTH 05°15'10" WEST 487.19 feet;
332. NORTH 42°04'41" WEST 501.75 feet;
333. NORTH 05°32'54" EAST 62.41 feet;
334. NORTH 61°50'22" EAST 111.08 feet;
335. NORTH 39°34'36" EAST 248.59 feet;
336. NORTH 17°18'49" EAST 292.43 feet;
337. NORTH 13°15'30" WEST 333.74 feet;
338. NORTH 45°57'59" WEST 590.17 feet;
339. NORTH 79°45'39" WEST 520.43 feet;
340. NORTH 02°27'29" EAST 481.66 feet;
341. NORTH 10°19'41" WEST 230.28 feet;
342. NORTH 18°16'06" WEST 59.99 feet to the TRUE POINT OF BEGINNING.

Containing 391,289,736 square feet of land (8,982.78 acres), more or less.

END OF DESCRIPTION

Basis of Bearings:
Bearings, coordinates, and distances used in above description are based on the California Coordinate System of 1983, Zone III, North American Datum of 1983 (CSRC) Epoch 2017.50. Distances are in grid unless otherwise noted, ground distances may be obtained by multiplying by a combination factor of 1.000037821 calculated at the abovementioned NGS Monument "QQ 453" (PID HS2787).

Surveyor's Statement:
This land description has been prepared by me, or under my direction, in conformance with the Professional Land Surveyors' Act.

Prepared By:

Frank A. Borges, P.L.S.

March 5, 2020
Date

FRANK A. BORGES
No. 7922
Exp: 12-31-21

MONTGOMERY
& ASSOCIATES

Appendix L-7

Adopted Metes and Bounds for Zone W-8

BOARD OF DIRECTORS
SANTA CLARA VALLEY WATER DISTRICT

RESOLUTION NO. 20-15

RESOLUTION ESTABLISHING GROUNDWATER BENEFIT ZONE W-8

WHEREAS, the Santa Clara Valley Water District (Valley Water) is charged with managing the groundwater subbasins in Santa Clara County per the Santa Clara Valley Water District Act and the Sustainable Groundwater Management Act; and

WHEREAS, the Santa Clara Valley Water District Act authorizes the Valley Water Board of Directors to establish zones encompassing areas where groundwater pumpers benefit directly and indirectly from Valley Water activities to protect and augment water supplies; and

WHEREAS, by assessing a groundwater production charge on water producing facilities within the groundwater benefit zones, Valley Water funds and implements projects and activities for the benefit of groundwater pumpers in the zone, ensuring continued groundwater supply and sustainability, consistent with the purposes set forth in the District Act and requirements of the Sustainable Groundwater Management Act.; and

WHEREAS, Valley Water established the two primary groundwater benefit zones (Zones W-2 and W-5 representing North and South County, respectively) in 1963 and 1977, respectively; and

WHEREAS, Valley Water's activities benefitting groundwater pumpers have changed, and new and more detailed information has become available regarding the groundwater subbasins Valley Water manages since the existing groundwater benefit zones were first established; and

WHEREAS, Valley Water undertook an independent, science-based study beginning in 2014 to ensure the zones reflect the most recent and relevant data regarding the services and benefits received by well owners and operators (well users); and

WHEREAS, Valley Water conducted the study with extensive public outreach including notices to potentially affected well users and interested parties, presentations to Valley Water Board of Directors committees and public agencies, meetings and communication with individual well users and water retailers, and open houses; and

WHEREAS, after completing the study using the best available science and considering information provided by well users, it was determined that all well users in proposed modified Zone W-8 are benefiting in a reasonably similar way from Valley Water activities to protect and augment groundwater supplies; and

WHEREAS, the results of the study and the recommendation to establish Zone W-8 were presented to the Board of Directors on August 27, 2019, and October 8, 2019; and

WHEREAS, on October 8, 2019, the Board of Directors directed staff to prepare metes and bounds to establish groundwater benefit zone W-8 for consideration at a public hearing.

NOW, THEREFORE BE IT RESOLVED that the Board of Directors of the Santa Clara Valley Water District declares as follows:

1. The boundaries of groundwater benefit zone W-8 are established as described in Exhibit A.
2. Groundwater benefit zone W-8 shall become effective on July 1, 2020.

PASSED AND ADOPTED by the Board of Directors of the Santa Clara Valley Water District by the following vote on April 28, 2020:

AYES:	Directors	R. Santos, G. Kremen, T. Estremera, N. Hsueh, B. Keegan L. LeZotte, J. Varela
NOES:	Directors	None
ABSENT:	Directors	None
ABSTAIN:	Directors	None

SANTA CLARA VALLEY WATER DISTRICT

NAI HSUEH
Chair, Board of Directors

ATTEST: MICHELE L. KING, CMC

Michele L. King
Clerk, Board of Directors

EXHIBIT A
COVERSHEET

METES AND BOUNDS DESCRIPTION FOR SANTA CLARA VALLEY WATER DISTRICT GROUNDWATER BENEFIT ZONE W-8 AT SANTA CLARA COUNTY, CALIFORNIA

No. of Pages:	9
Exhibit Attachments:	Attachment 1: Metes and Bounds Description for Santa Clara Valley Water District Groundwater Benefit Zone W-8 at Santa Clara County, California

METES AND BOUNDS DESCRIPTION
FOR
SANTA CLARA VALLEY WATER DISTRICT
GROUNDWATER BENEFIT ZONE W-8
AT
SANTA CLARA COUNTY, CALIFORNIA

ALL THAT CERTAIN AREA situate in the County of Santa Clara, State of California, being more particularly described as follows:

PARCEL 1:

COMMENCING at NGS Monument "M 362" (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of **N 1,884,274.45, E 6,233,024.82,** said railroad spike being **NORTH 16°38'26" WEST 64,286.80 feet** from NGS Monument "C 1193" (PID GU2195), being a 3-inch brass disc, punched and stamped "C 1193 1968", having grid coordinates of **N 1,822,679.97, E 6,251,434.42;**

Thence from said **Point of Commencement, SOUTH 12°59'23" WEST 27050.35 feet** to a point with grid coordinates of **N 1,857,916.31, E 6,226,944.54,** said point being the **TRUE POINT OF BEGINNING** ;

Thence the following one hundred one (101) courses:

1. **SOUTH 56°59'29" EAST 447.36 feet;**
2. **SOUTH 37°08'48" EAST 150.34 feet;**
3. **SOUTH 37°08'48" EAST 0.60 feet;**
4. **SOUTH 37°07'24" WEST 416.80 feet;**
5. **SOUTH 65°29'26" WEST 487.87 feet;**
6. **SOUTH 39°20'59" WEST 547.21 feet;**
7. **SOUTH 18°52'36" WEST 1193.05 feet;**
8. **SOUTH 67°00'08" WEST 675.91 feet** to a point, having grid coordinate of **N 1,855,201.46, E 6,225,360.25,** said point being **NORTH 18°48'55" EAST 561.84 feet** from NGS Monument "M 355" (PID HS5356), being a 3/4-inch iron pipe with a yellow plastic plug, having grid coordinates of **N 1,854,669.64, E 6,225,179.04;**

9. **NORTH 54°28'15" WEST 403.09 feet;**
10. **NORTH 50°28'28" WEST 1707.98 feet;**
11. **NORTH 31°10'57" WEST 560.84 feet;**
12. **NORTH 67°28'06" WEST 221.95 feet;**
13. **SOUTH 84°58'13" WEST 764.50 feet;**
14. **NORTH 63°06'51" WEST 199.22 feet;**
15. **NORTH 69°25'06" WEST 655.04 feet;**
16. **NORTH 66°13'15" WEST 1231.65 feet;**
17. **NORTH 54°51'27" WEST 832.39 feet;**
18. **NORTH 38°49'38" WEST 367.92 feet;**
19. **NORTH 16°46'16" WEST 393.17 feet;**
20. **NORTH 46°32'30" WEST 162.93 feet;**

21. **NORTH 02°18'49” WEST 289.52 feet;**
22. **NORTH 34°05'09” WEST 198.53 feet;**
23. **NORTH 09°11'11” EAST 407.64 feet;**
24. **NORTH 18°01'16” WEST 142.54 feet;**
25. **NORTH 41°11'12” WEST 543.07 feet;**
26. **NORTH 28°42'41” WEST 876.39 feet;**
27. **NORTH 34°59'55” WEST 367.96 feet;**
28. **NORTH 42°25'40” WEST 244.08 feet;**
29. **NORTH 42°49'54” WEST 2757.97 feet;**
30. **NORTH 33°43'09” WEST 259.12 feet;**
31. **NORTH 33°45'00” WEST 113.30 feet;**
32. **NORTH 08°57'34” EAST 1025.89 feet;**
33. **NORTH 28°56'06” EAST 562.08 feet;**
34. **NORTH 06°57'51” WEST 344.58 feet;**
35. **NORTH 37°12'14” WEST 157.90 feet;**
36. **NORTH 66°24'38” WEST 328.87 feet;**
37. **NORTH 51°27'42” WEST 536.58 feet;**
38. **NORTH 77°40'26” WEST 466.46 feet;**
39. **SOUTH 58°20'50” WEST 250.75 feet;**
40. **NORTH 76°21'37” WEST 86.05 feet;**
41. **SOUTH 86°00'14” WEST 567.59 feet;**
42. **SOUTH 64°44'40” WEST 109.77 feet;**
43. **NORTH 80°49'20” WEST 208.15 feet;**
44. **NORTH 07°17'57” WEST 235.79 feet** to a point, having grid coordinate of **N 1,866,682.66, E 6,213,978.28,** said point being **SOUTH 03°59'54" WEST 164.94 feet** from NGS Monument “M 103” (PID HS5329), being a 3/4-inch open iron pipe, having grid coordinates of **N 1,866,847.20, E 6,213,989.78;**

45. **SOUTH 85°33'44” EAST 216.89 feet;**
46. **NORTH 85°48'20” EAST 179.51 feet;**
47. **NORTH 71°15'00” EAST 128.01 feet;**
48. **SOUTH 77°06'10” EAST 178.28 feet;**
49. **NORTH 78°27'00” EAST 157.58 feet;**
50. **SOUTH 83°20'23” EAST 228.81 feet;**
51. **SOUTH 89°35'55” EAST 290.75 feet;**
52. **SOUTH 79°41'43” EAST 291.15 feet;**
53. **SOUTH 70°33'53” EAST 248.12 feet;**
54. **SOUTH 61°59'54” EAST 781.00 feet;**
55. **SOUTH 15°37'39” EAST 225.77 feet;**
56. **SOUTH 07°07'30” EAST 251.95 feet;**
57. **SOUTH 08°35'01” WEST 139.58 feet;**
58. **SOUTH 30°11'06” WEST 209.05 feet;**
59. **SOUTH 05°40'36” WEST 274.36 feet;**
60. **SOUTH 16°52'30” EAST 106.89 feet;**
61. **SOUTH 38°30'59” EAST 756.80 feet;**
62. **SOUTH 70°04'26” EAST 205.80 feet;**
63. **SOUTH 48°40'39” EAST 278.20 feet;**
64. **SOUTH 73°07'30” EAST 149.00 feet;**
65. **SOUTH 36°23'04” EAST 217.01 feet;**
66. **SOUTH 38°06'52” EAST 182.37 feet;**
67. **SOUTH 61°56'23” EAST 496.39 feet;**

68. **SOUTH 41°55'06" EAST 601.36 feet;**
69. **SOUTH 37°10'53" EAST 930.36 feet;**
70. **SOUTH 33°22'46" EAST 362.11 feet;**
71. **SOUTH 40°57'17" EAST 508.11 feet;**
72. **SOUTH 02°54'42" WEST 589.73 feet;**
73. **SOUTH 17°19'07" EAST 334.65 feet;**
74. **SOUTH 17°42'31" EAST 1738.13 feet;**
75. **SOUTH 21°26'45" EAST 276.22 feet;**
76. **SOUTH 48°37'25" EAST 575.90 feet;**
77. **SOUTH 76°31'30" EAST 489.03 feet;**
78. **SOUTH 28°32'01" EAST 226.28 feet;**
79. **SOUTH 52°41'48" EAST 414.91 feet;**
80. **NORTH 89°39'37" EAST 277.50 feet;**
81. **NORTH 85°40'47" EAST 519.45 feet;**
82. **NORTH 86°15'00" EAST 251.10 feet;**
83. **NORTH 49°18'39" EAST 300.55 feet;**
84. **NORTH 83°43'48" EAST 638.96 feet;**
85. **SOUTH 82°11'12" EAST 137.05 feet;**
86. **NORTH 87°40'34" EAST 322.05 feet;**
87. **SOUTH 56°35'34" EAST 102.22 feet;**
88. **SOUTH 05°40'41" WEST 655.93 feet;**
89. **SOUTH 01°16'53" EAST 577.41 feet;**
90. **SOUTH 20°37'30" EAST 106.89 feet;**
91. **SOUTH 33°21'23" EAST 379.11 feet;**
92. **SOUTH 54°22'30" EAST 106.89 feet;**
93. **SOUTH 65°46'35" EAST 280.00 feet;**
94. **SOUTH 88°07'30" EAST 190.47 feet** to a point, having grid coordinate of **N 1,856,369.66, E 6,224,936.76,** said point being **NORTH 08°06'40" WEST 1717.20 feet** from said NGS Monument "M 355" (PID HS5356), having grid coordinates of **N 1,854,669.64, E 6,225,179.04;**

95. **NORTH 60°05'30" EAST 208.00 feet;**
96. **NORTH 88°29'08" EAST 322.32 feet;**
97. **NORTH 63°45'00" EAST 169.83 feet;**
98. **NORTH 34°27'31" EAST 246.97 feet;**
99. **NORTH 53°02'22" EAST 923.68 feet;**
100. **NORTH 56°23'44" EAST 199.80 feet;**
101. **NORTH 32°13'50" EAST 578.91** to the **POINT OF BEGINNING.**

Containing 15,436,349.60 square feet of land (354.37 acres), more or less.

PARCEL 2:

COMMENCING at NGS Monument "M 362" (PID HS5363), being a railroad spike 4-inch below surface, having grid coordinates of **N 1,884,274.45, E 6,233,024.82,** said railroad spike being **NORTH 16°38'26" WEST 64,286.80 feet** from NGS Monument "C 1193" (PID GU2195), being a 3-inch brass disc, punched and stamped "C 1193 1968", having grid coordinates of **N 1,822,679.97, E 6,251,434.42;**

Thence from said **Point of Commencement, SOUTH 02°37'03" WEST 57,317.98 feet** to a point with grid coordinates of **N 1,827,016.26, E 6,230,407.33,** said point being the **TRUE POINT OF BEGINNING ;**

Thence the following one hundred seventy-nine (179) courses:

1. **NORTH 87°29'56" WEST 37.62 feet;**
2. **NORTH 79°23'16" WEST 199.43 feet;**
3. **NORTH 27°25'29" WEST 5628.92 feet** to a point, having grid coordinate of **N 1,832,050.96, E 6,227,581.16,** said point being **NORTH 44°29'28" EAST 2457.53 feet** from NGS Monument "U 1458" (PID HS5284), being a steel rod inside a monument well, punched and stamped "U 1458 1990", having grid coordinates of **N 1,830,297.86, E 6,225,858.93;**

4. **NORTH 21°42'48" WEST 293.54 feet;**
5. **NORTH 68°27'48" WEST 319.53 feet;**
6. **SOUTH 70°33'13" WEST 646.96 feet;**
7. **NORTH 41°59'24" WEST 645.55 feet;**
8. **NORTH 65°56'44" WEST 788.90 feet;**
9. **NORTH 53°38'36" WEST 1433.42 feet** to a point, having grid coordinate of **N 1,833,876.70, E 6,224,258.62,** said point being **SOUTH 83°03'18" WEST 97.81** feet from NGS Monument "HPGN D CA ADAMS RESET" (PID AA1876), being a 2.5-inch aluminum disc, punched and stamped "ADAMS RESET HPGN-D 1992", having grid coordinates of **N 1,833,888.53, E 6,224,355.71;**

10. **NORTH 22°07'32" WEST 199.42 feet;**
11. **NORTH 59°23'45" WEST 559.41 feet;**
12. **NORTH 46°53'12" WEST 642.09 feet;**
13. **NORTH 67°51'48" WEST 325.77 feet;**
14. **NORTH 67°30'21" WEST 496.14 feet;**
15. **NORTH 52°50'33" WEST 372.23 feet;**
16. **NORTH 19°39'38" WEST 109.04 feet;**
17. **NORTH 23°08'06" EAST 638.45 feet;**
18. **NORTH 11°40'39" WEST 145.51 feet;**
19. **NORTH 35°25'52" WEST 124.48 feet;**
20. **NORTH 25°02'21" EAST 249.95 feet;**
21. **NORTH 08°57'11" WEST 154.60 feet;**
22. **NORTH 67°19'08" EAST 192.95 feet;**
23. **NORTH 31°24'49" EAST 593.98 feet;**
24. **NORTH 17°33'41" EAST 713.50 feet;**
25. **NORTH 00°22'22" WEST 190.00 feet;**
26. **NORTH 61°21'36" EAST 410.29 feet;**
27. **NORTH 29°04'46" EAST 252.69 feet;**
28. **NORTH 25°34'24" EAST 613.80 feet;**

29. **NORTH 13°58'08” EAST 131.40 feet;**
30. **NORTH 62°55'26” EAST 248.22 feet;**
31. **NORTH 35°26'41” EAST 153.41 feet;**
32. **NORTH 11°14'21” EAST 121.66 feet;**
33. **NORTH 00°03'15” EAST 1292.31 feet** to a point, having grid coordinate of **N 1,840,835.20, E 6,224,186.91,** said point being **SOUTH 72°03'21" WEST 1006.35 feet** from NGS Monument “110 JD” (PID HS5283), being a 4-inch brass disc, punched and stamped “110 JD RESET 2001”, having grid coordinates of **N 1,841,145.25, E 6,225,144.31;**

34. **NORTH 25°44'08” WEST 488.14 feet;**
35. **NORTH 43°00'09” WEST 190.63 feet;**
36. **NORTH 11°10'09” WEST 424.70 feet;**
37. **NORTH 51°33'39” WEST 795.71 feet;**
38. **NORTH 25°44'40” WEST 135.81 feet;**
39. **NORTH 39°25'38” WEST 376.76 feet;**
40. **NORTH 70°42'06” WEST 283.05 feet;**
41. **NORTH 02°12'31” EAST 209.26 feet;**
42. **NORTH 12°14'54” WEST 163.82 feet;**
43. **NORTH 58°10'23” WEST 342.53 feet;**
44. **NORTH 42°05'27” WEST 718.68 feet;**
45. **NORTH 14°51'28” WEST 172.24 feet;**
46. **NORTH 31°06'04” WEST 477.13 feet;**
47. **NORTH 62°19'50” WEST 520.07 feet;**
48. **NORTH 23°08'00” WEST 1109.17 feet;**
49. **NORTH 42°05'50” WEST 551.56 feet;**
50. **NORTH 75°15'44” WEST 219.92 feet;**
51. **NORTH 85°16'18” WEST 362.14 feet;**
52. **SOUTH 78°23'32” WEST 340.00 feet;**
53. **NORTH 60°14'58” WEST 334.65 feet;**
54. **NORTH 81°38'43” WEST 252.98 feet;**
55. **NORTH 55°35'59” WEST 295.94 feet;**
56. **NORTH 79°01'44” WEST 457.67 feet;**
57. **NORTH 53°45'34” WEST 312.59 feet;**
58. **NORTH 83°48'24” WEST 205.66 feet;**
59. **NORTH 49°55'33” WEST 374.55 feet;**
60. **NORTH 70°20'29” WEST 1338.19 feet;**
61. **NORTH 56°23'27” WEST 398.01 feet;**
62. **NORTH 68°59'24” WEST 143.13 feet;**
63. **NORTH 82°31'53” WEST 367.47 feet;**
64. **NORTH 77°03'21” WEST 547.35 feet;**
65. **NORTH 55°59'38” WEST 497.56 feet;**
66. **NORTH 38°24'24” EAST 357.53 feet** to a point, having grid coordinate of **N 1,848,534.73, E 6,214,520.21,** said point being **SOUTH 10°03'54" EAST 431.40**

feet from NGS Monument "C 030" (PID HS5323), being a 2.5-inch brass disc, punched and stamped "SANTA CLARA VALLEY WATER DISTRICT", having grid coordinates of **N 1,848,959.50, E 6,214,444.82;**

67. **SOUTH 55°32'51" EAST 192.31 feet;**
68. **SOUTH 48°45'00" EAST 210.92 feet;**
69. **SOUTH 79°02'43" EAST 302.06 feet;**
70. **NORTH 76°52'30" EAST 106.89 feet;**
71. **NORTH 64°25'48" EAST 246.52 feet;**
72. **SOUTH 66°50'40" EAST 426.94 feet;**
73. **NORTH 87°19'14" EAST 122.14 feet;**
74. **NORTH 76°35'34" EAST 500.39 feet;**
75. **SOUTH 37°25'07" EAST 247.68 feet;**
76. **SOUTH 68°08'25" EAST 251.20 feet;**
77. **SOUTH 77°33'56" EAST 193.14 feet;**
78. **SOUTH 48°02'59" EAST 1307.30 feet;**
79. **SOUTH 44°46'35" EAST 328.50 feet;**
80. **SOUTH 66°56'37" EAST 359.04 feet;**
81. **SOUTH 82°38'56" EAST 1033.58 feet;**
82. **NORTH 84°15'23" EAST 231.12 feet;**
83. **NORTH 52°20'01" EAST 183.19 feet;**
84. **NORTH 85°14'06" EAST 279.12 feet;**
85. **SOUTH 66°02'11" EAST 2114.68 feet;**
86. **SOUTH 24°00'10" EAST 493.72 feet;**
87. **SOUTH 42°05'27" EAST 113.00 feet** to a point, having grid coordinate of **N 1,845,366.69, E 6,222,455.14,** said point being **NORTH 46°52'28" WEST 301.52 feet** from NGS Monument "T 1458" (PID HS5282), being a steel rod inside a monument well, having grid coordinates of **N 1,845,160.57, E 6,222,675.21;**

88. **SOUTH 60°40'28" EAST 783.43 feet;**
89. **SOUTH 45°41'59" EAST 302.49 feet;**
90. **SOUTH 66°51'29" EAST 205.89 feet;**
91. **SOUTH 39°49'00" EAST 271.46 feet;**
92. **SOUTH 69°00'27" EAST 189.91 feet;**
93. **SOUTH 30°18'09" EAST 229.02 feet;**
94. **SOUTH 44°53'37" EAST 165.30 feet;**
95. **SOUTH 75°17'13" EAST 178.68 feet;**
96. **SOUTH 16°17'14" EAST 225.19 feet;**
97. **SOUTH 50°18'00" EAST 229.26 feet;**
98. **SOUTH 22°45'06" EAST 2992.05 feet** to a point, having grid coordinate of **N 1,840,932.21, E 6,225,696.85,** said point being **SOUTH 68°54'56" EAST 592.19 feet** from said NGS Monument "110 JD" (PID HS5283), having grid coordinates of **N 1,841,145.25, E 6,225,144.31;**

99. **SOUTH 49°33'55” WEST 634.67 feet;**
100. **SOUTH 65°58'57” WEST 752.51 feet;**
101. **SOUTH 22°33'26” WEST 407.27 feet;**
102. **SOUTH 16°26'35” WEST 539.17 feet;**
103. **SOUTH 24°36'45” WEST 496.23 feet;**
104. **SOUTH 09°42'38” WEST 396.88 feet;**
105. **SOUTH 08°59'21” WEST 1215.95 feet;**
106. **SOUTH 09°39'34” WEST 327.16 feet;**
107. **SOUTH 32°13'55” WEST 192.41 feet;**
108. **SOUTH 51°54'31” WEST 222.81 feet;**
109. **SOUTH 22°17'29” WEST 152.97 feet;**
110. **SOUTH 06°15'57” EAST 527.46 feet;**
111. **SOUTH 09°16'34” EAST 482.02 feet;**
112. **SOUTH 25°10'02” EAST 1072.51 feet;**
113. **SOUTH 69°07'12” EAST 256.43** feet to a point, having grid coordinate of **N 1,834,451.31, E 6,224,194.04,** said point being **NORTH 16°01'40" WEST 585.55 feet** from NGS Monument “HPGN D CA ADAMS RESET” (PID AA1876), being a 2.5-inch aluminum disc, punched and stamped “ADAMS RESET HPGN-D 1992”, having grid coordinates of **N 1,833,888.53, E 6,224,355.71;**

114. **NORTH 78°07'19” EAST 145.82 feet;**
115. **NORTH 58°51'59” EAST 245.59 feet;**
116. **NORTH 70°19'08” EAST 1369.31 feet;**
117. **NORTH 89°13'06” EAST 734.89 feet;**
118. **NORTH 73°18'17” EAST 384.48 feet;**
119. **SOUTH 89°24'46” EAST 592.83 feet;**
120. **NORTH 50°10'44” EAST 276.68 feet;**
121. **SOUTH 74°13'33” EAST 1156.06 feet;**
122. **SOUTH 54°28'09” EAST 567.34 feet;**
123. **SOUTH 47°52'49” EAST 614.27 feet;**
124. **SOUTH 86°30'53” EAST 581.12 feet;**
125. **NORTH 72°35'45” EAST 692.34 feet;**
126. **SOUTH 18°05'43” EAST 321.68 feet;**
127. **SOUTH 16°07'20” EAST 1698.42 feet;**
128. **SOUTH 38°00'40” WEST 287.68 feet;**
129. **SOUTH 08°02'38” WEST 489.59 feet;**
130. **SOUTH 20°45'46” EAST 271.44 feet;**
131. **SOUTH 32°23'44” EAST 227.04 feet;**
132. **SOUTH 62°14'09” EAST 450.38 feet;**
133. **SOUTH 63°11'19” EAST 353.56 feet;**
134. **SOUTH 66°14'00” EAST 17.67 feet;**
135. **SOUTH 22°43'20” WEST 27.32 feet;**
136. **SOUTH 17°46'37” WEST 24.20 feet;**
137. **SOUTH 01°52'27” WEST 49.27 feet;**

138. **SOUTH 57°29'35” EAST 907.02 feet;**
139. **SOUTH 59°45'27” EAST 340.93 feet;**
140. **SOUTH 49°04'58” EAST 120.10 feet;**
141. **SOUTH 61°14'53” WEST 229.47 feet;**
142. **SOUTH 39°44'23” WEST 184.56 feet;**
143. **SOUTH 20°54'31” WEST 132.34 feet;**
144. **SOUTH 87°22'39” WEST 76.54 feet;**
145. **SOUTH 76°50'28” WEST 59.31 feet;**
146. **SOUTH 72°56'15” WEST 222.68 feet;**
147. **SOUTH 66°49'00” WEST 109.94 feet;**
148. **SOUTH 32°34'13” WEST 330.48 feet;**
149. **SOUTH 12°59'41” WEST 208.46 feet;**
150. **SOUTH 17°44'41” EAST 273.43 feet;**
151. **SOUTH 24°14'59” EAST 254.15 feet;**
152. **NORTH 88°26'09” WEST 68.20 feet;**
153. **NORTH 81°02'09” WEST 18.46 feet;**
154. **NORTH 40°11'12” WEST 31.43 feet;**
155. **NORTH 26°49'42” WEST 363.82 feet;**
156. **NORTH 11°16'20” EAST 16.11 feet;**
157. **NORTH 67°18'52” WEST 237.75 feet;**
158. **NORTH 53°15'52” WEST 42.87 feet;**
159. **NORTH 63°00'35” WEST 106.43 feet;**
160. **NORTH 26°59'25” EAST 140.05 feet;**
161. **NORTH 88°16'12” WEST 1407.24 feet;**
162. **SOUTH 08°11'13” WEST 37.23 feet;**
163. **SOUTH 76°43'08” EAST 241.04 feet;**
164. **SOUTH 66°12'49” EAST 241.99 feet;**
165. **SOUTH 61°06'07” EAST 205.19 feet;**
166. **SOUTH 16°03'28” EAST 29.42 feet;**
167. **SOUTH 30°22'45” WEST 18.58 feet;**
168. **NORTH 59°37'17” WEST 63.56 feet;**
169. **SOUTH 24°31'09” WEST 126.00 feet;**
170. **SOUTH 42°42'58” WEST 435.59 feet;**
171. **SOUTH 57°12'08” WEST 74.35 feet;**
172. **SOUTH 46°08'11” EAST 67.13 feet;**
173. **SOUTH 02°21'57” WEST 699.86 feet;**
174. **SOUTH 37°25'13” WEST 257.53 feet;**
175. **SOUTH 15°18'44” WEST 196.06 feet;**
176. **SOUTH 24°46'38” WEST 113.24 feet;**
177. **SOUTH 42°30'49” WEST 85.84 feet;**
178. **SOUTH 16°38'13” WEST 213.43 feet;**
179. **SOUTH 06°06'27” WEST 95.79** feet to the **POINT OF BEGINNING.**

Containing 49,832,298.78 square feet of land (1,143.99 acres), more or less.

END OF DESCRIPTION

Basis of Bearings:
Bearings, coordinates, and distances used in above description are based on the California Coordinate System of 1983, Zone III, North American Datum of 1983 (CSRC) Epoch 2017.50. Distances are in grid unless otherwise noted, ground distances may be obtained by multiplying by a combination factor of 0.99998858 calculated at the abovementioned NGS Monument "C 1193" (PID GU2195).

Surveyor's Statement:
This land description has been prepared by me, or under my direction, in conformance with the Professional Land Surveyors' Act.

Prepared By:

Frank A. Borges, P.L.S.

March 5, 2020
Date

LICENSED LAND SURVEYOR
FRANK A. BORGES
No. 7922
Exp: 12-31-21
STATE OF CALIFORNIA

MONTGOMERY
& ASSOCIATES

Appendix M

Groundwater Benefit Zone Exemption Process

HydroMetrics WRI

1814 Franklin St, Suite 501
Oakland, CA 94612

DRAFT TECHNICAL MEMORANDUM

To: George Cook, Santa Clara Valley Water District

From: Cameron Tana

Date: October 31, 2017

Subject: Groundwater Zone of Benefit Well Exemption Process

1. PURPOSE AND SCOPE

This memorandum provides a process for Santa Clara Valley Water District (District) staff to evaluate requests for exemption from a groundwater zone of benefit and, therefore, exempt water produced from the well from groundwater charges. The requests will be evaluated by the District staff to assess whether, in light of the submitted evidence, the District's determination to include the production well in the zone because it receives a benefit from District activities is reasonable and supported by evidence. The District staff's evaluation will be provided to the District's Board of Directors, which will decide whether the well should be exempt from the zone of benefit or re-assigned to a different zone of benefit.

2. GENERAL CHANGES FROM CURRENT PROCESS

This process includes the following general changes from the current process of groundwater charge zone modification, detailed in Document No. SOP465-103 from December 28, 2011:

1. This process assesses requests to exempt wells from a zone of benefit as opposed to exempting parcels. Document No. SOP465-103 provides a method for removing parcels from the zone of benefit.
2. Exemptions will be evaluated based on any relevant evidence that indicates the mapped boundary used to define the zone of benefit should be moved such that the well would be excluded from a zone or re-assigned to a different zone.
3. An evaluation that a well should be exempt from a zone of benefit will result in modification of zones of benefit but the modification will not be based on removing parcels from a zone of benefit. Instead, the modification will involve modification of zone boundary reflecting the relevant evidence indicating the

mapped boundary should be moved. The modification will also be consistent with boundary simplification approach used to facilitate legal descriptions of the zones. An example of a possible boundary simplification approach is summarized in section 9.2 and Appendix J of the Preliminary Zone of Benefit Study Report dated October 2017.

4. This process does not govern general modification of the zone of benefit resulting from changes to District activities or a revised understanding of the hydrogeology in the District, which is conducted pursuant to a separate process describing reviews of the zones of benefit.
5. The well may not be fully exempt from zones of benefit, and may be re-assigned with a different zone of benefit that is associated with a different set of District activities.

3. BASIS FOR WELL EXEMPTION

Wells will be exempted or re-assigned from zones of benefit based only any relevant evidence that the boundaries used to define the zones of benefit are not accurately mapped relative to the well location. The boundaries used to define the proposed zones are as follows (Section 8 of preliminary zone of benefit study report):

1. Bedrock/Alluvium contact
2. DWR basin boundary approximating groundwater divide between Santa Clara and Llagas Subbasins.
3. Coyote Narrows between Santa Clara Plain and Coyote Valley.
4. Santa Clara Formation outcrops.
5. Retailer areas where District treated water is delivered
6. Narrows between bedrock outcrops in Llagas Subbasin
7. Western boundaries of Morgan Hill and Gilroy.
8. Constrictions where alluvial channels are upstream of areas hydrogeologically connected to District activities.

There is uncertainty with these mapped boundaries, particularly with the geologic boundaries as discussed in Appendix J of the preliminary zone of benefit study. Local information at and around the well may show that the boundary is mapped incorrectly relative to the well. Any such local information will be evaluated to assess whether the boundary is mapped incorrectly and should be modified to exempt or re-assign the well.

Other approaches used to evaluate benefits in the zone of benefit study do not apply to individual wells. For example, groundwater elevations at a single well may not clearly demonstrate a benefit from District's activities, even if that benefit is occurring. As explained in the zone of benefit study, groundwater level benefits are evaluated by comparing groundwater level trends to the trends that would be expected if the District activity was not occurring. If a groundwater level trend is expected to decline without a District activity, a declining groundwater level trend could occur at any individual well even as a benefit from the District activity is demonstrated in the area based on multiple lines of evidence. Although groundwater level data from that well may not show an absolute improvement, a benefit is still realized because groundwater level declines would be greater without the District activity.

4. SUBMITTAL INFORMATION

The following information should be provided by the well owner requesting exemption or re-assignment:

- Well Owner Name
- Well Owner Mailing Address
- Well Owner Phone Number
- Well Owner Email Address (optional)
- Well Address or Parcel Number (if Different from Owner Mailing Address)
- Well Number
- Field Visit Request to Check Mapped Location or Observe Surficial Geology and Obtain Information Requested by Well Owner
- Claim of Geologic Formation (optional, e.g. bedrock, Santa Clara Formation)
- Any Relevant Information to Support Request

The well owner should also provide any other available documentation of the well's, nearby wells' or the area geology, such as drillers logs completed by a C-57-permitted drilling contractor, geologic logs by a registered California Professional Geologist, a geophysical logs, geophysical surveys, visual evidence of surface outcrops of geologic formations.

If the request for exemption is based on a claim that delivery area boundaries (i.e. retailer areas where District treated water is delivered and the western boundaries of Morgan Hill and Gilroy) are inaccurate relative to the well, the well owner should provide any available documentation supporting the claim.

5. DISTRICT EVALUATION PROCEDURE

5.1. Receive Request

The existing procedure for receiving a request in Document No. SOP465-103 from December 28, 2011 should continue to be followed. The main District activities in this step are:

- Compare submitted information to District records, including District copies of well logs.
- Confirm well is located in the correct groundwater zone of benefit and correct any discrepancies.

Before undergoing additional evaluation, the District should also confirm that a new evaluation of boundary near the well would change the well's zone of benefit assignment, based on the location of District activities assessed in the zone of benefit study. Some areas of bedrock have in-lieu benefits from the District's treated water deliveries to that area of the bedrock.

5.2. Field Visit

If requested in the submission, a District Professional Geologist will visit the well with the well owner present. The Professional Geologist should take the following actions on the visit:

- Compare well location with District mapped location.
- Record well coordinates with handheld Global Positioning System (GPS) unit
- Take photographs of well head and any surficial geologic features in surroundings
- Obtain any other information as requested by the well owner

Based on the field visit, District staff should update District records with any corrections to well locations and confirm the well is located in the correct groundwater zone of benefit. If the well is not located in the correct groundwater zone of benefit, any discrepancies should be corrected. Removing a well from a zone due to well location update is considered a record update as opposed to a well exemption requiring modification of the zone of benefit.

5.3. Conduct Evaluation of Boundary

If the well is located in the correct groundwater zone of benefit according to existing maps and the field visit, a Professional Geologist in the GMAU should conduct an evaluation of information pertaining to the boundary location. The evaluation will be based on information provided by the well owner, information in District records, and observations from a field visit.

Some geologic boundaries will be more difficult to evaluate than others. Identifying the various bedrock units should be relatively clear for evaluating the mapped location of the Bedrock/Alluvium contact, the location of Coyote Narrows, and the location of narrows between bedrock outcrops in the Llagas Subbasin. In contrast, identifying the Santa Clara Formation will likely be more challenging. Visual distinction between the Santa Clara Formation and Unconsolidated Alluvium can be difficult. To identify Santa Clara Formation, the Professional Geologist will compare the subject well information to well log information from nearby wells in the zone representing Santa Clara Formation, and in the zone representing Unconsolidated Alluvium. The Professional Geologist will make a professional judgement about which set of wells has geology most similar to the geology observed at the subject well. If the subject well is more like the geology of the wells in the Santa Clara Formation, boundary modification and well exemption or re-assignment should be evaluated. If the Professional Geologist is unable to make this distinction, the evaluation will conclude that the Santa Clara Formation has not been identified and boundary modification and well exemption or re-assignment should not be recommended.

To evaluate boundaries based on constrictions where alluvial channels are upstream of areas hydrogeologically connected to District activities, the Professional Geologist will evaluate information related to ground surface elevations, stream levels, and alluvial thicknesses. The Professional Geologist will make a professional judgement about whether these characteristics are more similar to the valley floor or the alluvial channels downstream of District reservoirs or alluvial areas that have been removed from the zone. If these characteristics around the well or more like areas that have been removed from the zone, boundary modification and well exemption or re-assignment should be evaluated. If the Professional Geologist is unable to make this distinction, the evaluation will conclude that alluvial channels upstream of areas hydrogeologically connected to District activities have not been identified and boundary modification and well exemption or re-assignment should not be recommended.

To evaluate boundaries based on retailer areas (areas that deliver District treated water, Morgan Hill, and Gilroy), GMAU staff will confirm information provided with the retailer and if the new information indicates that the boundary should be corrected, boundary modification and well exemption or re-assignment should be evaluated.

Boundary based on the DWR basin boundary representing the groundwater divide between the Santa Clara Plain and Llagas Subbasins will not be evaluated for adjustment based on local information. The groundwater divide is a regional characteristic of hydrogeology in the Basin and will not be revised based on local information. Evaluation of long-term changes to the groundwater divide will follow the process of zone of benefit review.

5.4. Modify Boundary and Recommend Exemption or Re-assignment

If the Professional Geologist determines that information warrants modification of the boundary, the Professional Geologist will recommend revised boundary based on all available information. The recommended boundary will also be consistent with boundary simplification approach used to facilitate legal descriptions of the zones. Based on the recommended revised boundary, the Professional Geologist will recommend whether the well should be in zone of benefit and what zone of benefit it should be assigned.

5.5. Documentation of Evaluation

District staff will produce a draft technical memorandum that includes:

- Summary of findings
- Comparison of submitted information to District records
- Documentation of field visit
- Evaluation of geologic data
- Recommendation of revised boundary modification if any
- Evaluation of zone exemption or re-assignment
- Appropriate figures with map locations and layers evaluated.

As directed in Document No. SOP465-103 , the draft technical memorandum will be reviewed by the Groundwater Management Unit manager and other appropriate staff, and comments from that review will be incorporated into a Final Technical Memorandum to be presented to Board for consideration

6. BOARD CONSIDERATION

The Board will consider input from the requestor and the evaluation and recommendation from Staff. If the Board approves a modification of the boundary, Staff will revise the metes and bounds. The revised metes and bounds will be taken to the Board for adoption.

Appendix N

Process to Conduct Future Reviews of Groundwater Benefit Zones

HydroMetrics WRI

1814 Franklin St, Suite 501
Oakland, CA 94612

DRAFT TECHNICAL MEMORANDUM

To: George Cook, Santa Clara Valley Water District

From: Cameron Tana

Date: October 31, 2017

Subject: Process to Conduct Future Reviews of Groundwater Zones of Benefit

1. PURPOSE AND SCOPE

This memorandum provides a process for Santa Clara Valley Water District (District) staff to conduct future reviews of the groundwater zones of benefit. It describes when the District Groundwater Monitoring and Analysis Unit (GMAU) should undertake reviews, and what those reviews should include. Reviews are based on changes to District activities and new information about hydrogeology in the District. All reviews should be documented, even if no modification of zones of benefit results. If the review results in a recommended modification to the zones of benefit, the recommendation will be presented to the District Board of Directors, and such a recommended modification will not take effect until approved by the Board. If approved by the Board of Directors, the modification will be codified by a revision of the zones' metes and bounds.

2. BACKGROUND

The preliminary draft zones of benefit are primarily defined based on demonstrated benefits from the two District activities: managed aquifer recharge and delivery of treated surface water. These are the District activities that are the largest contributors to Santa Clara County's water resources. In addition, the zones distinguish between managed aquifer recharge systems that only recharge local runoff and those that can also recharge imported water. Other District activities, such as recycled water delivery support, untreated surface water deliveries, indirect potable reuse, and potential direct potential reuse, provide a benefit but have contributions to the County's water budgets that are either small, difficult to measure, or difficult to separate from the benefits of the two primary District activities. Therefore these other activities were not used for defining zones of benefit in the preliminary zone of benefit study. However, changes to the location of these activities could change the zones of benefit. Therefore, although these other activities were not used to initially define zones of benefit, we have included a discussion in this document about ways in which they could modify the zones of benefit in the future.

3. GENERAL CHANGES FROM PROCESS FOR WELL EXEMPTION

This process includes the following differences from the current process of groundwater charge zone exemption, detailed in Document No. SOP465-103 from December 28, 2011, and the proposed process for well exemption (Appendix L of the preliminary zone of benefit study):

1. This process to review zones of benefit does not occur in response to requests for exemption from a zone of benefit from a well owner. A separate process describes exemption or re-classification of individual wells from a zone of benefit that focuses on local information that may justify revising zone boundaries near wells requested for exemption.
2. Currently, reviews are only initiated at District staff's discretion, and upon receipt of new information. This new process requires a review of zones of benefit if either of the following specified situations occur:
   a. Substantial changes to the type of District activities that provide the zone's benefits
   b. New hydrogeologic data become available

   Initiating review under these specified situations helps ensure the zones of benefit represent current District activities and the best available hydrogeologic information. The District can also set a scheduled interval to evaluate whether these specified situations have occurred.
3. The review tasks differ based on the situation that initiates the review.

4. ZONE OF BENEFIT REVIEW TRIGGERS

The preliminary draft zones of benefit are based on the areas where benefits are derived from the current locations of District activities. Therefore, the zones of benefit should be reviewed if existing District activities have a substantial geographic change, District activities are eliminated, or new District activities are added. Changes to the magnitude of District activities should not necessitate a review of zones of benefit.

The definition and extent of zones of benefit should be reviewed, and potentially revised, when any of the following changes to District activities occurs, or when any significant new hydrogeologic data become available.

4.1. Reviews Triggered by Changes to District Activities

Changes to any one of six District activities that provide groundwater benefits triggers a review of the zones of benefit when they entail a substantial geographic change. The definition of substantial geographic change is described for each activity in the following subsections.

4.1.1. Triggers Based on Changes to Managed Aquifer Recharge Programs

A substantial geographic change of the District's managed aquifer recharge activities would entail either:

- An addition or subtraction of managed aquifer recharge infrastructure that alters the geographic area benefited from managed aquifer recharge; or
- A change in the ability of a system to recharge imported water.

4.1.2. Triggers Based on Changes to Treated Water Delivery

A substantial geographic change of the District's treated water delivery area would entail a retailer adding or removing District treated water as a source of water for any of its service subareas. Adding or subtracting parcels or a subdivision to retailer's existing service subareas would not be considered a substantial geographic change in the alluvium areas because the area of hydrogeologic connection to treated water delivery areas will not have changed. However, adding or subtracting parcels or a subdivision to retailer's existing service subareas in bedrock would be considered a substantial geographic change because the zone of benefit boundary is based on the delivery area.

4.1.3. Triggers Based on Changes to Recycled Water Delivery

The preliminary draft zones of benefit are not based on the extent of demonstrated benefits from recycled water delivery. Instead, benefits from the District's recycled water activities are assigned to the existing zones of benefit in which the recycled water is delivered. Consistent with the zone of benefit study's assignment of recycled water activity to existing zones, the only substantial geographic changes that warrant a review of zones of benefit are:

- Removing an existing recycled water system from District activities; or
- Delivering recycled water to an area outside the zones currently receiving recycled water.

4.1.4. Triggers Based on Changes to Untreated Surface Water Delivery

The preliminary draft zones of benefit are not based on the extent of demonstrated benefits from the District's untreated surface water delivery. Instead, benefits from the District's untreated surface water delivery activities are assigned to the preliminary zones of benefit in which the untreated surface water is delivered. Untreated surface water delivery occurs to specific parcels, and was therefore considered not to be large enough to evaluate in the zone of benefit study. Consistent with the zone of benefit study, a substantial geographic change to untreated surface water delivery that warrants a review of the zones of benefit is delivery to an area outside the zones currently receiving untreated surface water.

4.1.5. Triggers Based on Changes to Indirect Potable Reuse Activities

The preliminary draft zones of benefit are not based on the extent of demonstrated benefits from planned indirect potable reuse; i.e., the replenishment of highly purified recycled water into the basin. Instead, the District's indirect potable reuse activities are assigned to preliminary draft zones based on existing and planned locations. A substantial geographic change to the planned locations may warrant a review of the zones of benefit.

4.1.6. Triggers Based on Changes to Direct Potable Reuse Activities

The preliminary draft zones of benefit are not based on the extent of demonstrated benefits from planned direct potable reuse. Instead, the District's planned direct potable reuse activities will be assigned to existing zones of benefit based on the location of the planned deliveries. A substantial geographic change to direct potable reuse activities that warrants a review of the zones of benefit is when the locations of the delivery areas for direct potable reuse are finalized.

4.2. Reviews Triggered by New Hydrogeologic Information

New hydrogeologic information may either change the District's understanding of groundwater flow within an existing zone of benefit or between adjacent zones of benefit. The triggering information for each of these two types of hydrogeologic information are described in the following subsections.

4.2.1. Triggers Based on Hydrogeologic Information within Existing Zones of Benefit

A new understanding that no reasonable basis supports the determination of a hydrogeologic connection within a zone of benefit could warrant subdividing the zone into multiple zones of benefit. The hydrogeologic information that would warrant a review of the zones of benefit include:

- Identifying a fault as a barrier to flow that could substantially reduce hydrogeologic connection within a zone;
- Identifying a pinching out of primary aquifer units; or
- Other information about subsurface geology that warrants substantial changes to an existing conceptual model of groundwater flow supporting a zone of benefit.

4.2.2. Triggers Based on Hydrogeologic Information between Existing Zones of Benefit

A new understanding of increased connection between zones of benefit could warrant expanding the zones, or combining multiple zones of benefit into a single zone. In some cases, such as the northern and southern boundaries of the Coyote Valley zone, new information could identify changed groundwater flow conditions. In other cases, such as the zones based on the extent of the Santa Clara Formation and Llagas and Uvas Creek Quaternary deposits west of Morgan Hill and Gilroy, new information could provide evidence of hydrogeologic connections with an adjacent zone where evidence of such a connection is currently lacking.

The hydrogeologic information that would warrant a review of the zones of benefit include:

- Changes to groundwater gradients at zone of benefit boundaries, such as the gradients in Coyote Narrows;
- Changes to the location of groundwater divides, such as that between Coyote Valley and Llagas Sub-basin;
- New hydrogeologic data in areas that lack any existing data, such as in and around the Santa Clara Formation;
- Changes to City service areas. The boundary of the zone of benefit representing the Quaternary deposits of Llagas and Uvas Creek with the zone of benefit representing the rest of Llagas Subbasin is partially based on the western boundaries of the cities of Morgan Hill and Gilroy. Without a documented geologic boundary in these areas, the cities' service area boundaries are used because the cities distribute groundwater pumped from the rest of the Llagas Subbasin throughout their systems. If the cities change the western boundaries of their service areas, the zone boundaries should be adjusted.

5. PROCESS FOR REVIEWING ZONES OF BENEFIT

The draft zones of benefit are based on available groundwater level, subsidence, and saltwater intrusion data measured over time, as well as groundwater modeling results where available. When changes are made to District activities, however, historical data regarding groundwater levels, subsidence, and saltwater intrusion will not be immediately available. As a result, it will be necessary to use other metrics to evaluate any resulting changes to the zones of benefit.

Groundwater modeling will be the preferred, primary tool, but can only be applied in areas where the groundwater model was adequate to define zones of benefit in the first instance. Groundwater modeling cannot be used to define the extent of benefits from District activities in certain circumstances, however. In particular, data and groundwater modeling results were not available when defining the zones of benefit in specific geologic formations. As described in the zones of benefit study, where modeling and data are not available, the preliminary draft zones of benefit are based on District activities occurring in those geologic formations and the interpreted hydrogeologic connection within those formations. In these areas where groundwater modeling is inadequate to define zones of benefit, the District will have to rely on evidence of hydrogeologic connections as the best available measure of changes in the geographic areas where wells are benefitted by District activities.

5.1. Zone of Benefit Reviews Using the Groundwater Model for Changes to District Activities

The following discussion applies to all areas where the groundwater model was adequate for defining zones of benefit.

Groundwater modeling should be performed in a manner consistent with modeling for the preliminary zone of benefit study. Model runs demonstrating the benefit of any substantial geographic change to District activity should be conducted for the same time period as the modeling in the zone of benefit study. Model runs simulating the changed District activity should be compared to model runs without the District activity to evaluate the extent of benefits from the changed District activity. Model runs will not evaluate the marginal effect of the changed activity by comparing the changed District activity to the unchanged District activity.

In general, the groundwater level results of the run with the changed District activities will be compared to the groundwater level results of the run performed for the zone of benefit study that simulates removal or reduction of District activities. If this comparison shows a substantial change in the area benefiting from the activity, the zone of benefit will be revised to reflect that substantial change.

Modeling for changes to specific District Activities are discussed in the following subsections.

5.1.1. Modeling Changes to Managed Aquifer Recharge Programs

The modeled groundwater levels incorporating the changed managed aquifer recharge activities should be compared to the modeled groundwater levels of the run performed for the zone of benefit study that simulates no managed recharge.

5.1.2. Modeling Changes to Treated Water Delivery Programs

The modeled groundwater levels incorporating changed pumping based on the changed delivery area will be compared to the modeled groundwater level of the run for the zone of benefit study that simulates increased pumping based on less in-lieu recharge throughout the current delivery area. The zone of benefit study assumed that the removal of delivered water would increase pumping in an amount equivalent to 50% of delivered water quantities. Modeling to reflect changes in District deliveries should be structured consistently, such that the addition of water deliveries to an area will decrease pumping by an amount equivalent to 50% of anticipated new deliveries, and the removal of water deliveries from an area will increase pumping by an amount equivalent to 50% of the removed deliveries.

5.1.3. Modeling Changes to Recycled Water Delivery Programs

If a recycled water system is removed from District supported activities, a model run will be conducted with increased pumping equaling the reduction of recycled water deliveries. If a recycled water system is added to District supported activities, a model run will be conducted with decreased pumping equaling the increase of recycled water deliveries. The modeled groundwater levels incorporating the changed pumping should be compared to the modeled groundwater levels of the run performed for the zone of benefit study that simulates no recycled water deliveries.

5.1.4. Modeling Changes to Untreated Surface Water Deliveries

The modeled groundwater levels incorporating reduced pumping due to changed untreated surface water deliveries should be compared to the results of another new run that simulates pumping without in-lieu recharge throughout the changed delivery area.

5.1.5. Modeling Changes to Indirect Potable Reuse

The modeled groundwater levels incorporating the pumping and injection changes related to new indirect potable reuse locations should be compared to the modeled groundwater levels of the historical baseline run performed for the zone of benefit study that simulates no indirect potable reuse.

5.1.6. Modeling Changes to Direct Potable Reuse

The modeled groundwater levels incorporating the pumping changes related to new deliveries of direct potable reuse water should be compared to the modeled groundwater levels of the historical baseline run performed for the zone of benefit study that simulates no direct potable reuse.

5.2. Modeling New Hydrogeologic Information

The model will also be used to model new hydrologic information where feasible.

5.2.1. Modeling New Hydrogeologic Information within Existing Zones of Benefit

New hydrogeologic data that suggest potentially reduced hydrogeologic connection within an existing zone of benefit should be incorporated into the District's groundwater model. Model simulations to compare runs with a District activity and with eliminated or reduced District activity should be performed with revised model. If model comparison results show a spatial break in areas where benefits occur from District activities, subdividing the zone into multiple zones may be warranted.

5.2.2. Modeling New Hydrogeologic Information between Existing Zones of Benefit

The District's groundwater model may be used to verify specific hydrogeologic changes between existing zones of benefit. These include:

- Verifying changes to groundwater gradients in Coyote Narrows will likely involve using runs of both the Santa Clara Plain and Coyote Valley groundwater models.
- Any new hydrogeologic data in areas that lack any existing data should be incorporated into the District's groundwater model to reflect the new hydrogeologic understanding. The revised groundwater model should be used to evaluate the revised extent of benefits from District activities.

5.3. Zone of Benefit Reviews Using Hydrogeologic Connections

The following discussion applies to all areas where the groundwater model was inadequate for defining zones of benefit.

For the areas where modeling of changed activities cannot be used to define the extent of benefits, changes to District activities must result in a review of the hydrogeologic connection between the District activity and the area in question based on assessment of hydrogeologically connected areas in the preliminary zone of study report. The report defined the Santa Clara Formation, Unconsolidated Alluvium of Coyote Valley and

Unconsolidated Alluvium along Llagas Creek and Uvas Creek west of cities of Morgan Hill and Gilroy as separate hydrogeologically connected areas that are not modeled. In general, the locations of any substantial geographic changes in District activities should be compared to the boundaries of these hydrogeologically connected areas to determine the geographic area and extent of impact from the change in District activities.

The following subsections address the review necessary for changes to specific District activities.

5.3.1. Managed Aquifer Recharge

In the preliminary draft zones of benefit, the geologic formations outside the models used for the study that receives a benefit from managed aquifer recharge included the Coyote Valley Unconsolidated Alluvium, and Llagas and Uvas Creek Unconsolidated Alluvium west of Morgan Hill and Gilroy. Removal of a managed aquifer recharge system could reduce the areas that has a hydrogeologic connection with managed aquifer recharge. Addition of a system could increase the areas that has a hydrogeologic connection with managed aquifer recharge.

5.3.2. Treated Water Delivery

In the preliminary draft zones of benefit, the geologic formation outside the models used for the study that receives a benefit from treated water delivery is the Santa Clara Formation. Removing District treated water as a source to a retailer subarea could reduce the area of the Formation that has a hydrogeologic connection with District's treated water.

In bedrock areas, the preliminary draft zones of benefit are based on the retailer areas receiving District treated water. If the retailer areas receiving District treated water in bedrock expand or contract, the zone of benefit should be revised to match those revised retailer areas.

5.3.3. Recycled Water Delivery

In the preliminary draft zones of benefit, there is no geologic formation outside the models used for the study receiving a benefit from recycled water deliveries. If recycled water is delivered to a new area outside all existing zones of benefit, the zones of benefit will need to be redefined to differentiate between the new area that is hydrogeologically connected to recycled water deliveries, and areas within the existing zones of benefit. If the areas within the existing zones of benefit receiving recycled water change, the zones of benefit will not change because it is defined by benefits from larger District activities but the assignment of recycled water benefits to zones will change.

If recycled water is delivered to bedrock in areas that do not match the areas in bedrock receiving treated water, the bedrock will have at least one additional zone that benefits from recycled water limited to the areas receiving recycled water.

5.3.4. Untreated Surface Water Delivery

In the preliminary draft zones of benefit study, the geologic formations receiving a benefit from untreated surface water deliveries included the Coyote Valley Unconsolidated Alluvium, and Llagas and Uvas Creek Unconsolidated Alluvium west of Morgan Hill and Gilroy. If the District delivers untreated surface water to a service area in non-bedrock areas, the zones of benefit will need to be redefined to differentiate between the new area that is hydrogeologically connected to the new untreated surface water deliveries and areas in the previous zones of benefit. If the areas within the existing zones of benefit receiving untreated surface water change, the zones of benefit will not change because it is defined by benefits from larger District activities but the assignment of untreated surface water benefits to zones will change.

Currently, deliveries of untreated surface water to parcels in bedrock areas are not assigned to zones of benefit. However, if untreated surface water is delivered to service areas in bedrock larger than parcels, those service areas will define a zone that benefits from this District activity. If the service areas receiving untreated surface water do not match the areas in bedrock receiving treated water, the bedrock will have at least one additional zone that benefits from untreated surface water limited to the areas receiving untreated surface water.

5.3.5. Indirect Potable Reuse

In the preliminary draft zones of benefit, the geologic formations receiving a benefit from indirect potable reuse included the Santa Clara Formation, Coyote Valley Unconsolidated Alluvium, and Llagas and Uvas Creek Unconsolidated Alluvium west of Morgan Hill and Gilroy. If the District expands its indirect potable reuse program to areas outside the existing zones of benefit, the zones of benefit will need to be redefined to differentiate between the new area that is hydrologically connected to the new indirect potable reuse deliveries and areas in the previous zones of benefit. If the areas within the existing zones of benefit where indirect potable reuse occurs or is planned change, the zones of benefit will not change because it is defined by benefits from larger District activities but the assignment of indirect potable reuse benefits to zones will change.

5.3.6. Direct Potable Reuse

If direct potable reuse delivery is established outside of existing zones of benefit, the zones of benefit will need to be redefined to differentiate between the new areas that are hydrogeologically connected to direct potable reuse and areas within existing zones of benefit. If no differences occur, the zones of benefit will not be revised; direct potable reuse will be assigned to the zone of benefit that is hydrologically connected to the direct potable reuse location. If the areas within the existing zones of benefit where direct potable reuse occurs or is planned change, the zones of benefit will not change because it is defined by benefits from larger District activities but the assignment of direct potable reuse benefits to zones will change.

5.4. Evaluating New Hydrogeologic Information in Areas that are not Modeled

Some new hydrogeologic information that becomes available may be related to the hydrogeologic connection outside the modeled area and will be assessed independently of the model.

5.4.1. New Hydrogeologic Information within Existing Zones of Benefit

For areas without groundwater level data or groundwater modeling results new hydrogeologic data could show less extent of connection within a geologic formation such as the Santa Clara Formation, Coyote Valley Unconsolidated Alluvium, and Llagas and Uvas Creek Unconsolidated Alluvium west of Morgan Hill and Gilroy. If the new understanding shows that some of these areas have substantially reduced hydrogeologic connection to locations of District activities, subdividing the zone into multiple zones is warranted.

5.4.2. New Hydrogeologic Information between Existing Zones of Benefit

Analyzing hydrogeologic connections between district activities and zones of benefit may be necessary to verify effects of new hydrogeologic data in specific areas. These include:

- Changes to the location of groundwater divides, such as that between Coyote Valley and Llagas Sub-basin will likely change the hydrogeologic connection between District activities and the boundaries of various zones of benefit
- Changes to City service areas will change the hydrogeologic connection between District activities and the boundaries of various zones of benefit

6. DOCUMENTATION

When the District determines that a review of the zone of benefit study is warranted and undergoes the review, the District should document the review in a draft technical memorandum with the following information for District Board consideration.

1. The situation that led to the review;
2. Summary of review evaluation, including new data, model results, and maps.
3. Recommended changes to zones of benefit, if any.

If the District Board approves a modification the zones of benefit, the District will revise the metes and bounds defining the zones.